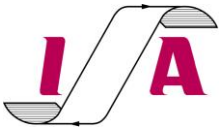
P25 Wide Area Trunked Radio Network Specification

OLD BRIDGE Township, NJ

Prepared by



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MAP FORMATS

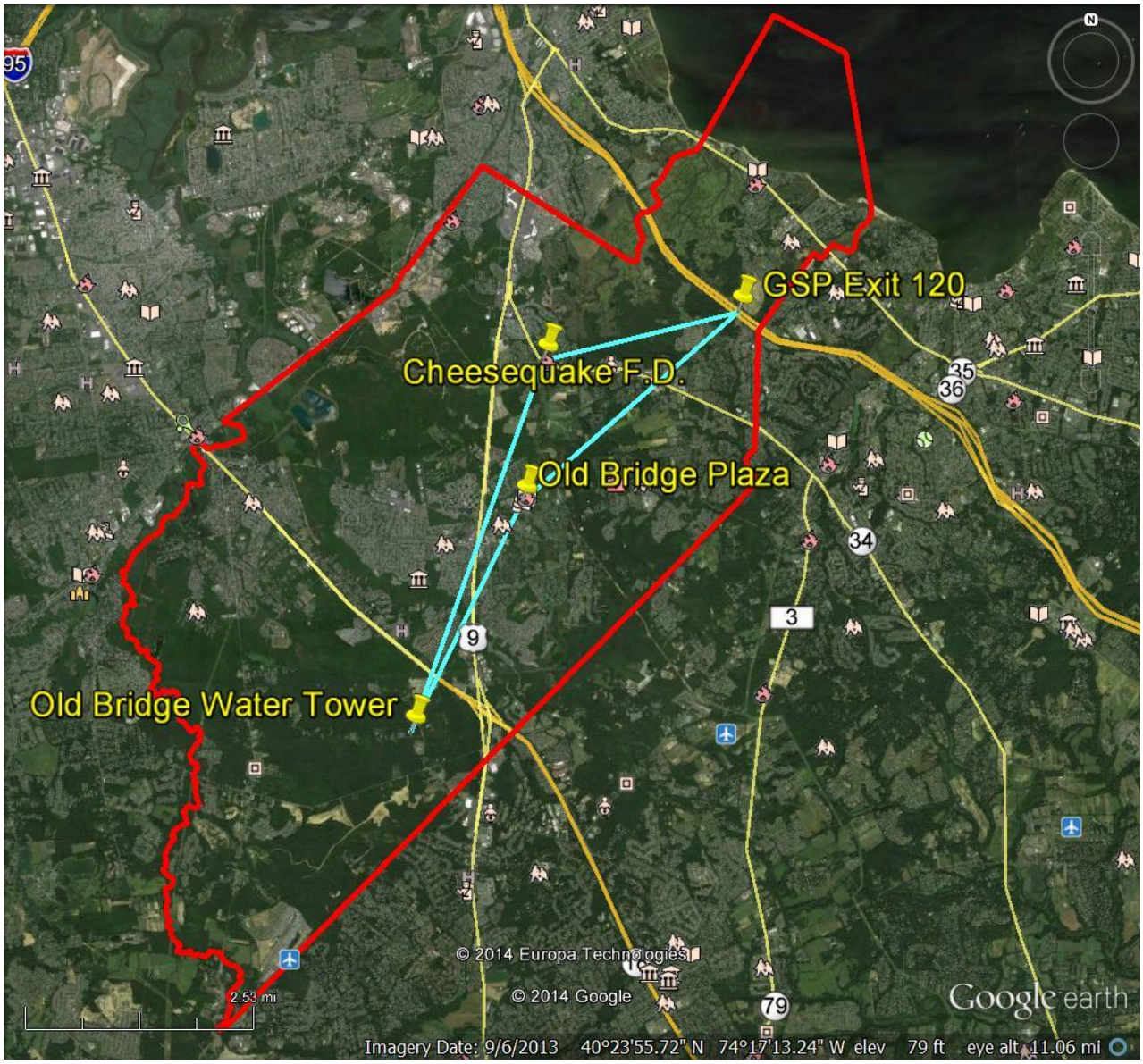

GSP Exit 120
Cheesequake F.D.
Old Bridge Plaza
Old Bridge Water Tower
© 2014 Europa Technologies
© 2014 Google
Google earth
Imagery Date: 9/6/2013 40°23'55.72" N 74°17'13.24" W elev 79 ft eye alt 11.06 mi

Figure 1 Conceptual 11 GHz Loop Microwave System

Coordinates:

- One OLD BRIDGE Plaza 40:24:13.4.0N 074:17:51.5W
- Garden State Parkway Exit 120 Southbound: 40:26:04.4.0N 074:15:05.5W
- Spring Valley and Marlboro Road Water Tower (East Greystone Road) 40:21:59.6N 074:19:04.0W
- Cheesequake Fire Station: 40:25:36.12N 074:17:35.26W

1. PROJECT OVERVIEW

1.1 Introduction

A. OLD BRIDGE TOWNSHIP is seeking proposals for an interoperable state-of-the-art trunked public safety emergency radio communications system to support mission critical communications within the TOWNSHIP of OLD BRIDGE and with selected mutual aid partners. The proposed communications system shall provide area-wide digital communications over a four (4) site loop digital microwave backhaul network for three (3) RF tower/antenna locations. The system design must offer full P25 Phase 1 functionality for interoperable standards-based communications using non-proprietary feature functions and encryption. The successful PROPOSER will be required to take full responsibility for the installation and performance of each of the following:

1. IP/TDM-Carrier Class microwave backhaul network comprised of four (4) sites

2. Equipment Installation at a new RF transceiver site. Facility related elements such as the shelter and generator shall be furnished by a site partnership with NJ TRANSIT Corp. UPS and associated component systems necessary for the Old Bridge Township system shall be provided by the successful PROPOSER.

3. Trunked 800 Digital P25 Phase 1 operational, Phase 2 capable system.

4. P25 single and dual band 800/UHF or 800/VHF , depending on end-user service agency, mobile and portable radio subscriber units

5. Dispatch Console Subsystem

B. The systems are expected to serve the communication needs of OLD BRIDGE TOWNSHIP law enforcement, fire/EMS and other township departments for the foreseeable future. Proposed equipment shall be easily adaptable to changing system requirements and new technology without the need to replace major equipment elements. Open system architecture is required. The system must provide IP based standardized interfaces as well as standard TDM T1 channels for possible back up while utilizing off-the-shelf router and switching products. The new system shall support a migration path to meet current FCC requirements for narrowbanding and shall be in compliance with future P25 Phase 2 TDMA standards.

1.2 System Overview

A. The system is comprised of six major elements which include:

1. The backhaul system which links all of the Township's sites for both transmit / receive functions and connectivity/control

2. The P25 trunked radio infrastructure equipment.

3. The in-building bi-directional communications system.

4. Subscriber equipment including portable radios, mobile radios, and control station radios. This document includes the specifications for all elements.

5. Dispatch Console Subsystem comprised initially of four (4) dispatch operator positions, expandable up to 300%.

6. Radio Facilities Subsystem necessary for all site improvement related materials and labor, including services related tower, shelter, backup power subsystems, antenna systems, electrical, HVAC, and/or grounding and bonding systems.

B. The system must be capable of supporting control room sub-systems (i.e. dispatch consoles, recorders), to comply with:

1. P25, CSSI, ISSI, standards and functionalities.
2. Expandable to 300% of additional users operator positions beyond the initial identified requirements
3. Console interface provisions for integration of trunked radio infrastructure, conventional radio equipment, telephone systems, and VOIP technologies.
4. Must strictly comply with P25 standards to allow multiple manufacturer subscriber units and independent choices of P25 products that may be of interest in the future.

C. The total P25 Trunked radio system shall be software controlled over the IP backhaul system to provide full functionality including, but not limited to, simulcasting and satellite receiver voting system reception. The PROPOSER shall provide two (2) full-time servers or network cores to be owned by OLD BRIDGE TOWNSHIP for control of all required functions. Servers to be located at two different sites. The locations of these servers shall be based on the design developed by the successful PROPOSER.

D. OLD BRIDGE TOWNSHIP intends to implement standards based system level interoperability with other P25 systems in the area and therefore requires the system to comply with the P25 ISSI standards and functionalities for future use.

E. The successful PROPOSER shall be required to demonstrate complete system operation on in a factory or warehouse staging environment, this test operation will include the demonstration of the trunked radio functions based on P25 operation as per specifications and prior to equipment installations at the actual transceiver sites, based upon agreed upon project milestones.

1.3 General Requirements

A. OLD BRIDGE TOWNSHIP is seeking a single ‘full-service’ PROPOSER or a team of PROPOSERS and their sub-contractors to provide the equipment and services to meet the TOWNSHP’s requirements as described herein.

B. In the case of a team, it is expected that one company shall assemble the members of the team and will act as prime contractor in submitting a single team RFP in response to this document. The PROPOSER must respond to offer their approach to accommodate subscriber requirements as outlined for the primary users identified in this document. The successful PROPOSER shall coordinate and provide their own project management for complete end-to-end, ‘turn-key’ system implementation to achieve a fully operational system per these specifications.

C. The TOWNSHIP intends to sign a single contract with a single company or prime contractor who shall be responsible for managing the work and products to be provided by other team members.

D. The TOWNSHIP shall be able to procure replacement equipment from various sources to the fullest extent possible in order to minimize end-of-life product issues.

E. The PROPOSER shall include a single point of responsibility for system maintenance, service and updates both during the initial 5years of operation but also for the subsequent years of use. The PROPOSER will include warranty and maintenance from the date of acceptance and maintenance pricing for years 2-5 to be selected at the discretion of OLD BRIDGE TOWNSHIP. PROPOSER shall include maintenance costs for provision of

preventative and corrective maintenance for each year for the four years following the expiration of the warranty period. OLD BRIDGE TOWNSHIP will require maintenance pricing for years 6-10. PROPOSER may provide pricing variables (i.e. CPI) for year's 6-10 maintenance in lieu of pricing. Maintenance throughout the period (Years 2-5 and Years 6-10) shall include software updates for infrastructure and subscriber units.

F. The PROPOSER shall minimize the use of proprietary equipment only available from the PROPOSER or single source. The PROPOSER should identify all components of the system not available off-the-shelf and only available from a single source.

G. PROPOSERs are encouraged to propose a system design that will best meet the requirements of OLD BRIDGE TOWNSHIP.

H. The PROPOSER must analyze and respond to all sections of this RFP and provide sufficient information and product prototype specification sheets as necessary to enable OLD BRIDGE TOWNSHIP and its engineers to evaluate the proposal. The PROPOSER must furnish all information as requested and complete all forms according to the section instructions. Any deviations or exceptions should be noted on the first page of the proposal submission*.*

I. The system shall be proposed as a complete system with firm prices for all of the equipment, software and services required by these specifications.

J. Project completion will be twelve (12) months after contract signing. Use of the system does not constitute acceptance.

1.4 Project Submittals

A. General

1. All project submittals shall be subject to review and approval by both OLD BRIDGE TOWNSHIP and its ENGINEER.
2. All submittals shall be provided in hard copy, paper format, and in electronic format on CD-ROM/DVD/Thumb Drive to the greatest practical extent.
3. PROPOSER shall provide three (3) hardcopies and softcopies of all submittals in addition to the approval copies.
4. All drawings will be provided in PDF formats, with AutoCAD and/or VISIO documents to be provided as available.
5. All hard copy, paper media submittals shall be appropriately bound separately or in three ring binders. Loose sheets are not acceptable.
6. Each page shall be numbered.
7. All submittals shall include a signed and dated cover letter of transmittal sheet fully describing the contents of the submittal.

B. The following information shall be submitted within 20 working days of contract signing:

1. The name of the person who will act as the Successful PROPOSER's official contact with OLD BRIDGE TOWNSHIP /ENGINEER.
2. Firm detailed project schedule indicating all project milestones and specific dates relating to the installation of the system.
3. The schedule shall include the following milestones:

a) Procurement

b) Cutover and Transition Plan
c) Pre-Shipment Integration Testing at PROPOSER's shop
d) Start and Finish of Shelter Hardware Installation
e) Start and Finish of RF Equipment Installation
f) Start and Finish of Microwave Equipment Installation
g) Start and Finish of Antenna System Installation
h) Start and Finish of Subscriber Equipment Testing
i) Start and Finish of Radio Consoles Installation and Testing
j) Start and Finish of Coverage Testing
k) Start and Finish of User and Manager Training
l) Final System Acceptance Testing and Inspection
m) Start and Finish of 30 Day System Reliability Testing
n) Commencement of Manufacturer Warranty Period
o) Submittal of Maintenance Plan
p) Delivery of Final Documentation
q) System Certification / Sign-off

C. The following information shall be submitted within 40 working days of contract signing:
    1. System block and system level diagrams.
    2. Patching schedules and termination details for all horizontal cables necessary for a complete record of the installation.
    3. Radio and microwave channel plans.
    4. Equipment room plan drawings which indicate scale, orientation termination, and proposed and existing hardware placement. The name of the building, room number, and the title of room shall be included. The PROPOSER must show dimensions of space designated for future expansion of equipment.
    5. Equipment rack/cabinet elevations. The name of the building, room number, and the title of room shall be included. The PROPOSER must show dimensions of space designated for future expansion of equipment.
    6. Detailed configuration information for each site, including link and launch delay settings, signal level settings, antenna manufacturer, model number, tilt, orientation, and mounting height required to achieve specified design coverage performance.
D. Final Design: The following information shall be submitted within 30 working days of contract signing:
    1. Any updates to previously submitted design information.
    2. The PROPOSER shall obtain all required permits and provide copies to the OLD BRIDGE TOWNSHIP /ENGINEER.
    3. System operation and maintenance manuals for all equipment including:
        a) Instructions for installation, alignment procedures, and testing.
        b) Information, procedures, and recommendations for maintenance and troubleshooting of the equipment.
        c) Factory test data

E. System Staging, Delivery, and Installation: The following information shall be submitted as equipment is staged, delivered, and installed:

1. Detailed Staging Acceptance Test Plan (SATP), for OLD BRIDGE TOWNSHIP review and approval, specifically describing the comprehensive series of tests that will demonstrate proof of performance and readiness for shipment.
    a) Detailed SATP shall be submitted no later than 90 days before the testing starts.
    b) Final SATP shall be approved no later than 30 days before the testing starts.
2. User manual – one copy per unit, to be kept at the installation site, plus three file copies delivered to the OLD BRIDGE TOWNSHIP.
3. Installation manual – one copy to be kept at the installation site plus three file copies delivered to the OLD BRIDGE TOWNSHIP.
4. Maintenance manual – one copy to be kept at the installation site plus three file copies delivered to the OLD BRIDGE TOWNSHIP.
5. Bill of Materials – one copy per shipment plus three file copies delivered to OLD BRIDGE TOWNSHIP.
6. Installation documentation shall include complete system and site drawings.

1.5 Successful PROPOSER Responsibilities

A. The Successful PROPOSER shall be responsible for providing all products and services to provide a complete working system, whether or not specifically required and proposed, unless specifically excluded from the project.

B. Provide all systems necessary to meet the specifications.

C. PROPOSER shall provide a statement in the response indicating they shall supply all drawings in PDF formats and also indicate the availability of AUTOCAD and VISIO formats.

D. Provide full installation and optimization services for the section of work that may include systems, subsystems, and components, as outlined in the proposal response, regardless of manufacturer.

E. Labor, travel, lodging, delivery, and other expenses shall be provided as part of the project. No additional charges for expenses shall be paid by the TOWNSHIP unless expressly agreed to in writing.

1.6 OLD BRIDGE TOWNSHIP Responsibilities

A. The TOWNSHIP will provide reasonable access to those facilities where equipment is to be installed.

B. The TOWNSHIP will coordinate with local authorities to secure water tank and tower site access as required.

C. OLD BRIDGE TOWNSHIP shall be responsible for coordination and licensing fees, if any, and signatures, as applicable.

D. FCC applications for the new water tank site at Marlboro and Pleasant Valley Roads will be completed by OLD BRIDGE TOWNSHIP ENGINEERS.

E. Local permits and site authorizations will be obtained by the successful PROPOSER as required.

1.7 Coordination Services

A. General

1. Successful PROPOSER shall be responsible for execution of all work and shall coordinate installation of all work with the TOWNSHIP and sub-contractors, if used.
2. Successful PROPOSER shall be responsible for all permits and approvals, submitting FCC Antenna Site Registration and FAA notifications and registrations. Successful PROPOSER shall be responsible for any fees or costs associated with filing required FAA forms, to include, where applicable costs incurred with supplemental filing, environmental impact statements, or other studies required to obtain approval unless otherwise agreed to in writing.

B. FCC Licenses

1. The PROPOSER shall be responsible for all microwave frequency research, coordination and preparation of all associated FCC license applications, and submittals on behalf of OLD BRIDGE TOWNSHIP. The PROPOSER shall complete Federal Aviation Administration (FAA) forms as necessary. FCC LMR licenses covering this project have been approved and received.
2. Successful PROPOSER shall research and prepare any FCC forms and submittals needed for existing and/or new sites for the backhaul channels and provide for signature and submittal.
3. Successful PROPOSER shall be responsible for coordination and licensing fees if any.

C. Access to Site

1. Coordination with OLD BRIDGE TOWNSHIP Municipal Utilities Authority will be required in order to gain access to the Pleasant Valley Road site and water tank. PROPOSER's Project Manager must coordinate with Authority as required throughout the course of the project for access and site details.

1.8 Project Management General Requirements

A. The PROPOSER must designate an on-site Project Manager assigned as a full time employee of the Successful PROPOSER, and who has significant experience on projects of similar complexity and content.

B. The Project Manager shall be responsible for managing the project in close coordination with the TOWNSHIP's Project Manager.

C. The Successful PROPOSER's Project Manager shall be the primary point of contact between the Successful PROPOSER and TOWNSHIP for all items within the scope of this project.

D. Successful PROPOSER shall certify, in writing, that the assigned Project Manager has the power to make significant decisions relevant to the project and has direct access to senior management for resolving issues beyond the Project Manager's direct authority.

E. The Project Manager shall attend meetings as required by the TOWNSHIP or other TOWNSHIP representatives.

F. Meeting minutes and reports

1. Successful PROPOSER shall provide written minutes of all meetings no later than five days after the meeting or two days prior to a subsequent meeting relating to the same issue(s), whichever is earlier.
2. Successful PROPOSER shall submit a written status report at the end of each week noting progress to date, meetings held, schedule adherence, and variances.

3. Successful PROPOSER shall provide written reports of all corrected actions, especially punch list items.

1.9 Instructions to Respondents

A. Pre-Proposal Conference

1. A single strongly recommended pre-proposal meeting and walk through of the site, water tank and schools will be held on July, 8, 2014 at 10:00 am in the Municipal Complex Lobby

B. Schedule of RFP Events

1. Advertisement June 25, 2014 Specifications can be downloaded on the Township website www.oldbridge.com
2. Question Period Submission of all questions will begin on June 30, 2014 and conclude on August 1, 2014. All questions must be by email to

   Purchasing @ oldbridge.com
3. Bid Opening Wednesday August 13, 2014 @ 9:00 am

1.10 RFP Response Format

A. Proposal responses shall provide all requested information in the format and sections as described below.

B. Failure to submit a proposal in accordance with the format below or failure to provide any of the material as outlined in this section may result in the rejection of the proposal by the TOWNSHIP. Rejection shall be at the sole discretion of the TOWNSHIP.

1. Cover Letter & Executive Summary

   a) Tab 1 of the proposal document shall contain a cover letter providing an introduction to the attached proposal response and stating that the proposal meets the TOWNSHIP's requirements. The Proposal Cover Letter must be signed. Signatory shall be a person legally empowered to sign the proposal on behalf of the proposing entity. Tab 1 shall also contain an Executive Summary overview of the PROPOSER's organization, experience, system, equipment, and services proposed.

2. Table of Contents

   a) Tab 2 of the proposal document shall contain a complete table of contents for the proposal.

3. Mandatory Submittals

   a) Tab 3 of the proposal document shall include the Proposal Form and all mandatory submittals listed on the PROPOSER's Checklist.

4. PROPOSER's Qualifications and Experience

   a) Tab 4 of the proposal document shall contain descriptions of the PROPOSER's qualifications to execute this project, recent experience, and other supporting information that describes the responder's ability to fulfill performance requirements.

      i) Mission and history – Provide a brief history of the proposing company, its products and services, and repair return and support programs.

      ii) Financial information – Provide statements of financial position, including a copy of the latest certified annual audit of the company, and such other financial reports and/or other evidence of financial solvency, bonding

capabilities and other background information supporting the capability of the PROPOSER to provide the goods and services proposed in a timely and workmanlike fashion.

iii) Public safety radio system experience – Demonstrate a minimum of five years of experience in the design and completed installation of similarly configured P25 PH1 radio systems. PROPOSERs shall demonstrate their experience and capability to provide similar systems of the sophistication and complexity by offering details of similar projects for public safety agencies. The systems and equipment shall be from manufacturers with no less than 5 years' experience in providing radio, microwave, IP and associated technologies. The PROPOSER shall describe its role in these projects (e.g., manufacturer, integrator, prime contractor, subcontractor, installer, etc.)

iv) PROPOSERs shall provide information on subcontractors to be used for installation and local maintenance services. Information will include qualifications in terms of years in business, experience, size of facilities and number of technicians and their average years of experience in maintenance of communications equipment and systems of this type. Minimum shall be 5 years

v) Manufacturer's qualifications – Describe the PROPOSER's experience in manufacturing equipment similar to that indicated for this project with a record of successful in-service performance. Demonstrate that the company is actively involved in the design, manufacture, supply, installation, and integration of telecommunication equipment and antenna systems used by public safety providers.

vi) Installer's qualifications – Describe the proposed Installer's qualifications. Demonstrate that the Installer is an authorized representative of the equipment manufacturer for both installation and maintenance of equipment required for this project. Provide evidence that the Installer has current employees who have received training in the installation, operation, and set-up of relevant radio communications systems and related equipment and in recognized training courses related to proper grounding. Such training must be specifically geared towards two-way radio and/or microwave tower sites and similar communications facilities.

vii) List of comparable contracts – Include a list of comparable systems that have been installed and operational for a period of one year. Projects must include public safety radio, microwave, and associated antenna systems, as opposed to experience in the installation and deployment of cellular systems. The list shall include the TOWNSHIP or municipality name and address, a general description of the location of the system, and a contact person, telephone number and e-mail address.

viii) Supporting documentation –Include additional information to accurately represent the PROPOSER's qualifications. This shall include any and all information necessary for the TOWNSHIP and its ENGINEER to evaluate the technical capabilities of the PROPOSER's company, including brochures, general descriptions, or other material provided by the manufacturer that adequately illustrates and describes the system being proposed.

5. 5. Proposed Staffing Plan and Individual Experience

a) Tab 5 of the proposal document shall contain descriptions of the PROPOSER's organization chart, staffing plan, project management plan, and resumes of key personnel who will work on the project.

i) Organization chart – Provide an organizational chart describing the composition of the PROPOSER's organization, illustrating the relationships of the proposed services with other organizational divisions, programs and sections. Indicate the lines of organizational management, authority, and responsibility.

ii) Staffing plan – Provide a staffing chart that describes the proposed project staffing plan identifying staff positions (by name and title, if known) and reporting responsibility. PROPOSER may combine the organization and staffing charts, if they contain all of the requested information. PROPOSER shall include key subcontractor personnel.

iii) Staff resumes – Provide brief resumes for all key personnel to fill positions in the staffing plan to accomplish the requirements in the proposal. Resumes should provide sufficient information to determine that the person is qualified for the assigned position. Resumes shall be included, at a minimum, for the following designated personnel:

a) Project manager – Specify the lead project manager who will be assigned to this project and the manner in which the project manager will participate in the overall management of this project and its implementation. Provide references for the Project Manager. Demonstrate relevant experience with projects of similar size and complexity and ability to effectively manage scope, time, cost, and quality and address differing stakeholder needs, expectations, and identified and unidentified requirements.

b) Lead project engineer – Specify the lead technical engineer who will be assigned to this project.

c) Installation personnel – Demonstrate relevant experience in installing equipment identical or similar in application and scope to the equipment proposed in the PROPOSER's proposal. At least one trained employee who will monitor and oversee the installation, set up, and related grounding work. Submit evidence that at least one employee has completed an OSHA approved Tower Climbing Safety and Rescue course such as those by Comtrain or Tractel within the last 12 months

d) Startup personnel – Demonstrate relevant experience and training to start up systems of the type described by the PROPOSER. These personnel must be specially trained personnel directly employed by, or are factory trained and authorized representatives of, the equipment manufacturer.

e) Training personnel – Demonstrate substantial experience in the radio communications field with experience in live classroom presentation and classroom management.

6. Compliance

a) Tab 6 of the proposal document shall contain compliance statements on both a general and on a specific item basis. PROPOSER shall explicitly state in the

proposal that their offering is fully compliant with the requirements except as specifically and otherwise noted. Compliance is assumed unless specifically identified by section number, and identified as follows:

i) COMPLY – Shall be used to indicate that the proposed solution fully complies with the requirement as written.

ii) COMPLY WITH CLARIFICATION – Shall be used if most, but not all of the specified requirements are met. The requirements not met must be explained in detail. If the deviation of the requirement is significant enough, it may be considered a major or minor exception.

iii) EXCEPTION – Shall be used if the proposal does not substantially meet the specified requirements. Failure to indicate any exceptions shall be interpreted that the PROPOSER intends to fully comply with all RFP requirements as written. Explanation must be made for each item for which exception is taken, giving in detail the extent of the exception, and the reason for which it is taken. The TOWNSHIP reserves the right to give consideration or waivers for these exceptions. Additional explanation, description, or clarification may be supplied to amplify the Compliance Matrix responses. However, the statement of COMPLY, COMPLY WITH CLARIFICATION, or EXCEPTION will control.

7. Description of Proposed System, Equipment & Software

a) Tab 7 of the proposal document shall contain a detailed description of the proposed system, including cut sheets, specifications, manuals, diagrams, and other pertinent data. Engineering plans shall be included in this section.

i) System description – Provide a detailed description and engineering plans of the proposed system(s) including complete equipment lists for the following:

a. Main backbone components of the system, specifically the necessary repeaters, microwave equipment, radio network voting and control system, base stations, antennas and antenna systems, combiners, multi-couplers, servers, digital radio consoles, installation and testing thereof, and related engineering of the system.

b. Microwave system capacity requirements.

c. Conceptual space requirements and site layout.

ii) Point of Manufacture – Include a statement of location where the proposed equipment is manufactured.

iii) Data sheets – Include data sheets and specifications for radio network equipment, microwave equipment, subscriber equipment, antennas and other critical infrastructure components (description literature, product cut sheets).

8. Description of Warranty and Maintenance Services

a) Tab 8 of the proposal document shall contain the detailed description of the warranty and maintenance services available, with an identification of those specifically included in the proposal.

i) Warranties – Describe general and extended warranties included in the proposal.

ii) Maintenance – Describe the maintenance services included in the proposal.

iii) Test equipment – Include a list of tools and equipment (common and specialized, and including any built-in testing facilities that are functionally equivalent to external test equipment) necessary to install, operate and maintain all equipment proposed in the quotation.

iv) Spare parts – Provide a list of the spare parts that are included in the PROPOSER's response to meet the TOWNSHIP's requirements as well as any other spare parts inventory recommended to adequately support the system defined in this specification.

9. Project Implementation Management and Schedule

a) Tab 9 of the proposal document shall provide information on project implementation, including the project management philosophy, the project team, a detailed description of work to be performed, a preliminary project schedule, a list of project risks and mitigation plans for these risks.

i) Project management plan – Include a project management plan with a preliminary project schedule including the delivery schedule and installation of equipment from award of contract to final acceptance.

ii) Acceptance test plans – Include the Preliminary Factory Acceptance Test Plan, Coverage Acceptance Test Plan, and Final Acceptance Test Plan, testing methodology, and procedures to assure complete and fully operable system at project completion.

iii) Training plan – Include the recommended training courses, by recommended user groups, and the preliminary testing methodology and procedures to assure complete and fully operable system at project completion.

iv) Transition plan – Include the preliminary transition plan for replacing/upgrading radio consoles, including control, administration and related equipment from existing system(s) to the new TOWNSHIP wide system architecture.

10. References

a) Tab 10 shall contain a list of the PROPOSER's references. References shall be the PROPOSER's prior customers. Reference information shall include telephone number and person to contact for whom the systems/equipment similar to that being proposed have been installed and operating (carrying communication traffic) for a significant length of time.

11. Additional Information

a) Tab 11 of the proposal document shall contain additional information that the PROPOSER believes will materially augment the proposal but does not fall into any of the above categories.

b) PROPOSER shall submit with their proposal a copy of their generic safety manual and program.

c) PROPOSER must submit a copy of their proposed standards manual in either hardcopy or electronic form with its proposal to demonstrate its familiarity with applicable standards.

12. Pricing

a) The proposed prices shall be itemized per the pricing sheets; failure to provide itemized price lists will be grounds for disqualification of the proposal.

   i) PROPOSER shall provide an itemized list of equipment and installation costs for all equipment proposed. Installation costs shall be included for all proposed equipment and components.

   ii) PROPOSER shall include maintenance costs for provision of preventative and corrective maintenance for each year for the four years following the expiration of the warranty period.

   iii) Sources and list prices shall be provided for all listed tools and test equipment not included in the price proposal.

   iv) PROPOSER shall include all costs to provide maintenance services to begin on the one year anniversary of the warranty period with the approval of OLD BRIDGE TOWNSHIP. Pricing for years two (2) through five (5) shall be provided on the Form of the Proposal at an annual rate.

   v) Any annual software license fees or software maintenance fees shall be clearly identified in the PROPOSER's response and shall either be rolled into the software maintenance contract fee or paid in full as part of the initial system price. Pricing for years two (2) through five (5) shall be provided on the form at an annual rate. OLD BRIDGE TOWNSHIP will require maintenance pricing for years 6-10. PROPOSER may provide pricing variables (i.e. CPI) for year's 6-10 maintenance in lieu of pricing. Annual maintenance is renewable at the Township's option on the anniversary of the contract.

b) Proposals shall be honored for no less than 90 days.

2. SYSTEM DESCRIPTION

2.1 Existing System and Requirements

A. Police Department

1. The OLD BRIDGE Police Department operates a Motorola 6-channel (trunked) analog 800 MHz simulcast system with a 4 position dispatch center that was re-banded several years ago. The system supports upwards of 600 radio portable and mobile units for police, 4 fire districts, 5 ambulance services and a host of TOWNSHIP departments.

2. There are two transmit/receive sites on the legacy simulcast SMARTNET Trunked radio system. OLD BRIDGE Plaza which consists of a primary transmit/receive system controller; back-up system controller; and CEB connected to a voting system and consoles. Exit 120 on the Garden State Parkway consists of a simulcast site linked to the OLD BRIDGE Plaza controller through a landline T-1 connection.

3. Two additional sites are included in this project

    A. Old Bridge Water Tower -- for construction of a new antenna site at Pleasant Valley/Marlboro Road Water Tank. This site is intended to provide coverage into the southern portion of OLD BRIDGE TOWNSHIP and sections of adjoining towns.

    B. Cheesequake Fire Station, Rt. 34 – for construction of a new microwave link between the GSP Exit 120 site and the Old Bridge Water Tower site in order to facilitate Loop Microwave System between the three (3) RF transceiver sites.

4. Old Bridge High School has a separate in-building channel for police use in the legacy system. This will be replaced by an in-building BDA system that will now extend the outdoor trunked radio system coverage inside the school. The current channel will be re-allocated for use as a Township-wide conventional simulcast system as Old Bridge has a need for one (1) P25 800 MHz repeated radio channels as a back-up and special events operations. These would be simulcast channels with transmitter/receivers at all 3 transmitter sites. These simulcast channels will be separate from the TRUNKED Digital Network. The antenna's required for the TRUNKED Network can be shared with the with this single simulcast channel.

B. Fire and Emergency Medical Service Requirements

1. The primary operational objective of the new radio system design is to achieve minimum voice communications availability for in-street portable coverage of 95/95 in addition to providing interoperable communications with intra-departmental, inter-departmental and mutual aid partners. Proposers shall also show the extent to which 95/95 in-building communications can be achieved using the same three (3) RF transceiver sites assuming that the RF signal will be attenuated by twelve (12) dB of building penetration.

2. OLD BRIDGE has four volunteer fire districts providing fire suppression services and five volunteer and paid EMS organizations. With a residential population of 65,000 and a mix of industry, waterfront and recreation areas each fire and EMS organization provides for the needs of their individual communities within the TOWNSHIP. The Fire Departments also provide routine mutual aid to communities within the region including towns in Middlesex and Monmouth counties. EMS agencies provide Basic Life Support services for OLD BRIDGE and provide mutual

aid to other area communities similar to that of the Fire Service. Advanced Life Support is provided by Robert Wood Johnson Medical Center and Raritan Bay Medical Center.

3. Each Fire District represents a volunteer fire department. They include: District 1-Laurence Harbor Fire Department, District 2-Cheesequake Volunteer Fire Department, District 3-South OLD BRIDGE Volunteer Fire Department, and District 4-Madison Park Volunteer Fire Department. Also within these organizations are Fire Prevention Bureaus who provide fire inspections.

4. The five volunteer EMS organizations include: Laurence Harbor Volunteer First Aid Squad, Cheesequake Volunteer First Aid Squad, Old Bridge First Aid and Rescue (Red & White). Old Bridge Volunteer First Aid Squad (Green & White) and Madison Park Volunteer First Aid Squad. OLD BRIDGE TOWNSHIP Emergency Medical Service (OBTEMS) is a paid service that operates throughout the TOWNSHIP.

5. Fire districts and EMS agencies have a history of experiencing interoperable communications gaps with mutual aid partners in adjoining communities who use an assortment of UHF and VHF frequency bands making communications during critical events difficult and at times dangerous to first responders.

6. Old Bridge Township utilizes a VHF- Low Band channel 46.42MHz for paging the Township's Fire and EMS agencies. FCC Licenses for reference are KDD911 and KFP440. The PROPOSER shall provide a replacement continuous duty base station and antenna system to be placed at Old Bridge Police Department's Antenna site located at Police Headquarters. The antenna shall be at the height of the existing VHF low Band antenna and shall have an output power of 300 W, ERP. Old Equipment shall be removed from service once the new equipment is tested according to the test plan.

7. PROPOSER shall furnish and install a second continuous duty base station operating on VHF Low band -- 45.92MHz -- at the height of the existing VHF low band antenna and shall have a power output of 50 W ERP. Antenna shall be placed at the Cheesequake Fire Department located at Rt. 34 at Old Mill 40-25-35.4N, 074-17-20.5W. This low band channel shall be integrated into the dispatch console subsystem so that it can be cross patched to the 800 MHz fire ground operations channel. Old Equipment shall be removed from service once the new equipment is tested according to the test plan.

2.2 Standards

A. PROPOSERs shall provide P25 trunked radio infrastructure equipment compliant with the Common Air Interface (CAI), Inter-RF Subsystem Interface (ISSI), and Console Subsystem Interface (CSSI).

B. The data network must use IETF RFC-3550 and all other standard communication protocols throughout the network so that the use of a standard IP "sniffer" can be used for network troubleshooting. *The use of PROPOSER proprietary communication protocols is not acceptable.*

C. All encryption technology shall be non-proprietary as described in these specifications.

2.3 System Architecture

A. System Block Diagram – PROPOSER shall provide a complete high level block diagram for the entire proposed system showing the repeater sites, wide area system controller(s), site controllers, dispatch console connections, and any other major system

components (such as IP routers, system management computer, data gateway, recorders connectivity, etc.). PROPOSER shall provide bandwidth requirements and other performance requirements for the links between the various sites of the proposed system.

B. Dispatch Center Locations – PROPOSER shall provide a block diagram for the equipment at the dispatch center location, showing all major components and the quantity and type of communication circuits required to connect the dispatch center equipment to the wide area system controller. PROPOSER shall provide a list of all power and HVAC requirements for the dispatch center equipment.

C. System Controller Location – PROPOSER shall provide a block diagram and floor plan for the system controller location at OLD BRIDGE Plaza tower site and a second tower site to be identified by the PROPOSER showing all major components and the quantity and type of communication circuits required to connect the wide area system controller to repeater site controllers, gateway controllers, remote dispatch consoles, conventional repeaters, other wide area system controllers, data networks, etc. PROPOSER shall provide a list of all power and HVAC requirements for the wide area system controller equipment.

D. Repeater Site Locations – PROPOSER shall provide a block diagram and floor plan for all three trunked repeater site configurations, showing all major components at the site and the quantity and type of communication circuits required to connect the site controller to the wide area system controller. PROPOSER shall provide a list of all power and HVAC requirements for the repeater and site controller equipment.

2.4 Old Bridge Township System Frequencies

Shown in the table below are the FCC authorized RF channels that shall be deployed for this system.

CH.	Trunked Frequencies			Current Licensee
1	851.8625	806.8625		WNVR831
2	852.1375	807.1375		
3	852.2750	807.2750		
4	852.9375	807.9375		
5	851.6625	806.6625		
6	853.1625	808.1625		
7	853.9875	808.9875		WPMW665

2.5 Radio Coverage Requirements

A. Coverage Predictions

1. PROPOSER will be responsible for demonstrating mobile and portable radio coverage performance in accordance with the test plan defined later in these specifications. Coverage will be defined as ninety-five percent (95%) area coverage reliability throughout the political boundaries of Old Bridge Township ninety-five percent (95%) of the time, (aka “95/95” coverage) for a portable radio operating outdoors. Proposers shall demonstrate coverage design with documentation prior to system acceptance. PROPOSERS shall also provide coverage predictions showing residual in-building with 12 dB building penetration loss, using coverage from the same sites that depict portable-in-street coverage.

2. Radio system coverage shall be predicted through use of a radio wave propagation model that has been developed on the basis of theoretical and empirical data, which will take into account terrain irregularity, foliage, urban clutter, noise, and long and short term signal variations. The model used for the purposes of the coverage

prediction shall be identified, and the rationale for system RF link budget (e.g., power, gain, and loss information used in the model for each site) shall be described by the PROPOSER.

3. Single site and multi-site composite coverage plots shall be presented on an appropriate scale not to exceed 1 inch = 1 mile.

B. Voice Quality
1. Coverage is defined as the minimum signal required providing a Delivered Audio Quality 3.4 (DAQ 3.4) voice quality, defined as “speech understandable with repetition only rarely required, and with some noise and/or distortion” in accordance to TSB-88-C. PROPOSER shall specifically document the minimum signal strength, in units of microvolts/meter needed to produce a DAQ 3.4, the voice quality requirement for acceptance testing purposes.

C. Mobile Coverage Requirement
1. The boundary of the mobile coverage shall be clearly indicated on the PROPOSER’s coverage maps provided with their proposal. PROPOSER shall provide detailed RF propagation coverage prediction analysis for the limiting case of talk-out or talk-back for mobiles.

2. There is a known area of weak coverage in Cheesequake Park. Proposers shall design the system so as to ensure that this existing coverage deficiency is resolved.

D. Portable Outdoor Coverage Requirement
1. The boundary of the portable outdoor coverage shall be clearly indicated on the PROPOSER’s coverage maps provided with their proposal. For the purposes of providing a coverage prediction, Proposer shall assume that the portable radio is located on the hip (3 feet AGL) for receive and transmit operation with use of shoulder microphone (SMA without antenna stub).

2. PROPOSER shall provide detailed RF propagation coverage prediction analysis for the limiting case of talk-out or talk-back for portable outdoor coverage. PROPOSER shall provide a statement of talk-out to talk-back system balance by including a link budget report. Minimum outdoor coverage requirements are “95/95” portable with a demonstrable audio quality of DAQ 3.4 or better within the boundaries of Old Bridge Township.

E. Portable In-building Coverage Requirement
1. Proposers shall clearly show where Old Bridge Township may expect portable in-building voice coverage assuming 12 dB building penetration loss for the structures utilizing the same sites that guarantee 95/95 portable-in-street coverage. The boundaries of the portable in-building coverage areas shall be clearly indicated on the PROPOSER’s coverage maps provided with their proposal.

2. PROPOSER shall provide detailed RF propagation coverage prediction analysis for the limiting case of talk-out or talk-back with in-building portables. PROPOSER shall provide a statement of talk-out to talk-back system balance.

F. Simulcast
1. The use of simulcast is throughout the complete proposed network. On a per channel basis, the system technology shall be equipped to designate any repeater at any site as the master repeater that will determine which receive path to re-transmit (receive voting.) The voting technology shall be incorporated into the repeater including distributed voting control without the use of external voting comparator

equipment. Failsoft operation will not be considered a viable level of back-up functionality.

2. The Simulcast Repeaters shall communicate with the Simulcast Trunked Site Controller and with each Master Simulcast Repeater to perform the receiver voting decision and transmission synchronization processes through the use of an IP backhaul.

3. PROPOSERs shall indicate how the simulcast system survives to multiple failures including a catastrophic disaster at any simulcast master repeater. A dynamic reconfiguration of the master repeater to another repeater is required to avoid a total loss of RF coverage.

4. To improve the radio coverage of portables the system shall vote the receivers at the three simulcast sites. All repeater stations shall be GPS synchronized to maintain simulcast and voter operations.

2.6 In-Building Bi-Directional Amplifier System – 806-809 MHz/851-853 MHz

A. OLD BRIDGE TOWNSHIP High School currently operates on a stand-alone conventional radio repeater pair for the purpose of communicating with police dispatch and first responders when they are at the schools. The purpose of the current configuration was to mitigate the lack of reception within the schools on the current trunked system. The new trunked system shall be designed and installed such that all areas inside the High School facilities have sufficient signal from the trunked radio system to provide DAQ 3.4 audio quality to a portable radio worn at the hip level. These systems shall include the antennae, cables and active devices, along with the necessary hardware to support their functions.

B. Throughout the in-building coverage areas, the BDA/DAS system shall provide coverage of a minimum of 8 dB in excess of the existing composite signal level for each signal generated for each carrier served, but not lower than -65 dBm. Outside of the buildings, the signal strength from the DAS shall not exceed -100 dBm beyond 100 feet from the building exterior walls.

C. The existing trunked radio system coverage inside the facility has not been measured. Proposers are required to perform a coverage survey and present their results as part of their proposal.

D. The PROPOSER shall provide and install all amplifiers, cables, antennae and other such systems or equipment as may be required to facilitate an operational In-Building system coordinated with the other systems in this specification.

E. The In-Building System will be capable of operation in the 769--853 MHz frequency range. The PROPOSER shall perform talk tests utilizing P25 portable radio equipment as proposed by the PROPOSER in all areas of the OLD BRIDGE Middle and High Schools.

The BDA system shall be capable of accurately and properly amplifying and distributing radio signals without causing any sort of radio system degradation. It shall be minimally capable of using the following modulation formats:

1. FM
2. C4FM
3. QPSK
4. CQPSK

5. DQPSK
6. H-DQPSK
7. H-CPM
8. 16QAM,
9. 16QAM, 64QAM BPSK
10. OFDM (all varieties)

F. The BDA system must operate on battery power for a minimum of three hours in the event of power outage within the each school. Further, Proposer must integrate the BDA system with the school generator.

G. Talk Out shall be tested inside school buildings in all areas to validate appropriate reception and coverage.

H. Technical Equipment Details

1. The BDA system shall be FCC-type accepted and labeled prior to operation.
2. The BDA system shall be powered by the building's electrical system. A transient voltage surge suppressor shall be provided as part of the RFP directional amplifier design and protect the incoming power line from transients.
3. The BDA unit shall be furnished in a wall mounted NEMA 4 cabinet. The cabinet shall have a front door that is provided with a locking handle. Adequate space inside the cabinet shall be provided for servicing the unit. The unit shall be labeled with an exterior nameplate and all internal components shall be identified with labels.

I. External Antennas

1. The exterior antenna system shall include all necessary antennas, antenna mounts, coaxial lightening surge suppressor and minimum 1/2 " type LDF coaxial cable feed to the BDA. The exterior antenna shall be configured to mount on or near the building rooftop at a location providing the best view towards the nearest radio repeater site. The antenna gain will be selected to provide the minimum required signal level.
2. A lightning surge suppressor shall be connected in the RF coaxial feed line in-between the antenna and the BDA. The antenna system, mast, coaxial cable and surge suppressor shall be grounded by attachment to the building grounding system using Motorola Standard R-56 grounding requirements, or approved equal.

J. Internal Antennas

K. The in-building system shall consist of sufficient number of antenna's and/or radiating cable distributed with the building to meet the -65 UPS Minimum Requirement: 1500 VA / 4 hours

2.7 Trunked Logging Recorder

A. PROPOSER shall propose a computer based, IP, P25 and NG911 compatible digital voice logging recorder capable of capturing voice conversations as they occur without requiring recombination of the individual voice segments (non-trunked). The Logging Recorder Interface will consist of two separate logging recorder audio outputs for each operator position:

1. Radio select audio
2. Radio un-select audio

B. All outputs shall be suitable for connection to an instant recall recorder or logging recorder with acceptable levels and terminated as necessary. The system controller shall interface with the system manager, console system, logging recorders, and site controllers to monitor system and equipment parameters.

C. Recorder shall be designed as a scalable open architecture system with industry standard off-the-shelf PC components.

D. Recorder shall have sufficient ports and capabilities to record:

1. 911 Trunks (5)
2. 800 MHz Radio Channels (7)
3. Analog lines (16)
4. Digital lines (12)

E. Recorder shall have sufficient quantity of ports to record each radio channel separately in addition to the console selected and unselected audio

F. Proposers are to include 2 recording system options for consideration. One in the base RFP and an alternate that can meet the requirements of these specifications and its intended operation.

G. Accepted trunked logging recorders

1. NICE
2. KOVA
3. Exacom
4. Motorola
5. Eventide

3. SYSTEM FUNCTIONAL REQUIREMENTS

3.1 System Operational Mode

A. The basic operational mode of the system will be digitally trunked, with the field units monitoring a digital control channel and a trunking controller making traffic channel assignments over the control channel. Most of the communications will use this mode with radio transmission taking place over repeater sites located throughout the served territory. Wide area calls over multiple sites will take place in a similar manner, except calls will be routed to the applicable repeater sites by a wide area controller, or preferably directly by IP routers using IP simulcast technique to enhance the reliability of the proposed system. The mobile and portable radios will also enable users to manually select communication modes such as the use of conventional channels or talk-around mode when out of range of a trunked repeater site.

B. PROPOSER shall specify whether the proposed system uses a centralized architecture or a decentralized architecture and how the proposed architecture suppresses any single point of failure.

3.2 Wide Area Communications

A. The system shall provide the ability to place and receive calls to and from any point in the network covered by the trunked radio sites.

B. All sites shall be linked to the wide area radio network by means of digital microwave, or Township owned fiber optic cable, or a combination thereof. This backhaul network shall be packet switched using non-proprietary Internet Protocols (IP).

C. Roaming and Handoff

1. The system shall permit the radio user to roam across the entire area of coverage without requiring manual switching or changing of site information.

2. The system shall be capable of track visitor users as they roam into the network, authorize the registration and communication affiliations, and allow communications with visitor's home systems through the use of the P25 ISSI protocols.

3.3 Voice, Data and Control

A. The trunked radio system shall support both voice and data communications and utilize the P25 raw bit rate of 9600 bps for control channel transmissions as the primary access method to voice communications.

B. Voice, data, and control transmissions shall use an air link and modulation technique to ensure uplink/downlink balanced RF coverage. The system shall provide the capability to configure individual channels as data only or shared voice and data. Mobile and portable radios shall be capable of voice and data operation.

C. The system shall support voice calls and data messaging to a single mobile or portable radio without loss (in the case of conflict it is permissible for the data messages to be delayed).Suitably equipped mobile radios shall be capable of transmitting on voice while receiving data, and vice versa.

3.4 Dispatch Consoles

A. OLD BRIDGE requires a four (4) console operator positions and (2) remote IP consoles connected via LAN/WAN to the Trunking Radio network. The remote console shall be capable of being placed on ruggedized laptops so that dispatch can be performed from an off-site location if necessary. The console system shall be easily expandable to at least double the required capacity. The PROPOSER shall utilize commercial off the shelf

(COTS) components where possible to allow easiest and cost effective replacement as needed where possible.

B. The PROPOSERs shall list and support a minimum of two (2) P25 CSSI console manufacturers tested and TIA compliant with the proposed system.

C. Regardless of fixed or remote consoles the IP solution shall provide a dispatch console that provides:

1. A complete interface to PROPOSER submitted P25 solution
2. Windows IP-based solution with end-to-end non-proprietary encryption from and to console to base station
3. PC or computer-based systems must contain solid state hard drives to reduce ambient noise.
4. Allow for console subsystem interface (CSSI) for interconnectivity
5. ISSI capability for connection and communication to adjoining systems
6. Capable of providing clear radio audio to the radio operator from the field units even if the incoming audio is less than 3.4 DAQ
7. Access to all talk groups without the need for control stations
8. Easily configured displays so that dispatchers can configure talk groups based on their specific duties per position,
9. Two-tone sequential paging capabilities using pre-programmed Icons without the use of a third party solution
10. Ability to encode/decode and display P25 User ID tones logging each transaction
11. Ability to turn off a field radio
12. Instant recall of audio – up to 15 minutes.
13. Console shall be fault tolerant where one console can go off line with the remaining consoles operational 99.999% of the time
14. Capability to provide channel patching between radio channels
15. Provide All Point Bulletin capability where the dispatcher can broadcast across preselected channels
16. Common interface to attach all positions to logging recorder
17. Have the ability to interconnect to 9-1-1 telephone consoles utilized in dispatch
18. Provide for selected and unselected audio for talkgroup/channels appearing on the screen
19. Console shall be capable of interfacing to radio gateways to access other radio networks not in the P25 radio network
20. Allow for cross muted audio between positions and channels
21. Shall support connection to a variety of radio manufacturers (not just providing manufacturer)
22. Allow for clear and encrypted audio simultaneously

D. Control Stations for Backup to Dispatch Consoles

1. Proposers shall provide four (4) control station radios that shall be integrated into the Console Operator positions for use as backup in case of link failure between the primary dispatch consoles and the radio infrastructure.

2. The control stations shall be capable of accessing all talkgroups accessible to dispatch consoles in the trunked radio system.

E. Dispatch Features

1. Dispatch Console Override

a) This feature ensures that calls originating from a dispatch console cannot be blocked by normal members of the same voice group.

b) There are situations where it is desirable for the dispatcher operator of the system to have the ability to override an active call of a radio subscriber.

2. Radio Disable

a) The purpose of this feature is to prevent a lost or stolen radio subscriber unit from being used to transmit and receive on the system.

b) The system shall have the ability to selectively enable or disable an individual radio from the system management computer.

c) PROPOSER shall indicate to what extent the proposed system is capable of preventing a stolen radio from accessing the system.

3. Caller Identification

a) The radio ID shall be included in each transmission. The system shall display this ID on its associated group module in the console at the dispatch center.

b) Suitably equipped mobile and portable radios shall be able to display the calling unit ID for both individual and group calls.

c) Each mobile radio, portable radio, control station, and dispatch console shall be capable of displaying an alphanumeric alias corresponding to the unit ID.

4. System Access by Unauthorized Devices

a) The system shall prevent access by unauthorized devices. The PROPOSER shall indicate whether this is accomplished through unit and group validation at the repeater trunking controller, or through a unit authorization/registration procedure.

3.5 Encryption

A. The consoles and the subscribers units shall be equipped to handle the latest AES or non-proprietary encryption standard supported by P25 standards. These standards will be required for operation.

B. Encryption shall include the capability for over the air rekeying (OTAR) of mobile and portable radios.

C. All voice channels on the network shall be capable of end-to-end encryption from a dispatch console to a mobile or portable radio and from one mobile or portable radio to another mobile or portable radio.

D. Operation in encrypted voice mode shall be transparent to users, except that an icon or some other indicator on the mobile or portable radio and at the console shall indicate such operation.

E. OLD BRIDGE requires multiple encryption keys for a variety of uses. Keys shall become the sole property of the TOWNSHIP following the initial deployment of equipment. The PROPOSER shall provide at a minimum of two key loaders with keys preloaded. PROPOSER will provide necessary administrative training on how to change and load keys as necessary.

3.6 Trunking Features

A. Basic Trunking Operation

1. The system shall support voice group operation, where a voice group consists of a number of operational users distributed through the radio network.
2. The radio user manually selects the voice group he wishes to communicate with, and then presses PTT on the radio. If resources are available the system shall respond by establishing a voice call to the selected group. Once the group call has been established, voice from the source radio is transmitted to all members of the group, which may involve multiple repeater sites.
3. The system shall track voice group members as they roam through the network and ensure that each multi-site call is routed to all repeater sites containing active members of that voice group. The system shall not activate radio resources at sites unless they are active participants to that voice group.
4. The system shall support “all calls” to agencies and fleets through suitable definition of voice group membership.

B. Call Queuing

1. If resources are not immediately available the system shall queue the request and inform the user that the call is queued through a suitable audible indicator. The user can then release PTT. Later when channel resources become available the system shall establish the call and notify the user through an audible “grant” indicator. The user can then press PTT and the call proceeds in a normal fashion.

C. Voice Group Priority

1. The system shall queue calls based on voice group priority, with a minimum of fifteen (15) priority levels. Calls will be positioned in the queue based on priority, with calls of highest priority being serviced first. Calls of equal priority shall be processed on a first in, first out basis. Any call can be promoted as an emergency call by the radio users or the console. In that case, the emergency call shall have a highest priority than any non-emergency call.

D. Ruthless/Smooth Preemption

1. The system shall permit to define on a group per group basis if the group call leads to smooth or ruthless preemption in case of emergency. If smooth preemption is required, the preemption of lower priority call is performed after waiting that the preempted call becomes inactive. If ruthless preemption is required, the preemption of lower priority call is performed even if a radio is transmitting (losing audio being sent to the consoles). In any case (ruthless or smooth), the system shall queue the preemption if it detects the preemption would lead to two radio subscriber transmissions interfering on a traffic channel.

E. Individual Call

1. The system shall support individual call mode, where a suitably equipped radio or console user can establish a private call to any other radio user in the network.
2. In individual call mode the group membership is limited to the source and destination radios and the call will not be overheard by other mobile or portable units.
3. PROPOSER shall indicate how an individual call is established in the proposed system.

F. Emergency Alert and Emergency Call

1. The system shall support emergency call in the mobile and portable radios.

2. When the emergency button is pressed on a mobile or portable radio, the radio shall immediately transmit an emergency alert message to the central dispatch location. The emergency alert message should include the radio ID, alphanumeric alias, emergency talk group, and the site location of the radio, and the actual location of the radio if available through GPS.
3. GPS output from Emergency Alert feature will be required to be integrated into the OLD BRIDGE TOWNSHIP E911 mapping system for display, translation and conversion of latitude/longitude GPS data to mapping references.
4. Upon receipt of an emergency alert message the system shall establish an emergency voice call upon PTT request of the radio SU being in emergency.
5. An emergency voice call shall have a highest priority than any non-emergency call.

G. Trunking Assignment Messages

1. The control channel shall continually transmit assignment information allowing a user to join calls in progress after the group has been assigned a working channel. As long as the radio is turned on and is in range of the system, users shall not miss a call.
2. The PROPOSER shall indicate the number of voice calls for which trunking assignment information is transmitted each second on the control channel.

H. Late Call Entry

1. The system shall permit a user who has just re-entered radio coverage or was engaged in another call to late enter into a call in progress.
2. The PROPOSER shall indicate the typical average delay between a radio entering service (for example completing another call), and starting hearing the new call (late entry).

I. System Call

1. The system shall support a group call using the system group ID involving all the SU of the system. Dispatch consoles and subscriber products shall be able to initiate a System Call.

J. Channel Access Time

1. Proposer shall specify maximum network-wide trunked voice channel access time from initial push-to-talk assuming the system is in a non-blocking condition.
2. Proposer shall specify access time for both direct and trunked modes. Proposers shall describe the variables that impact channel access time in a non-blocking condition, and the tools and/or features available for optimizing access time.

3.7 Interoperability

A. Trunked Systems

1. The system shall be capable of providing standards-based system level interoperability with others trunked radio systems from the same or different manufacturers and shall comply with the P25 ISSI standards for future deployment. Interoperability is defined as the capability to dynamically connect, control and expand voice groups across radio systems. It is not acceptable for an operator to be required to set up such connections.

B. Number of ISSI/CSSI Connections

1. The system shall support a total of 6 ISSI/CSSI connections to other systems. PROPOSER shall state the number of ISSI/CSSI connections available in the

system for connection to mapped talk groups in other systems, the number that is used in this system implementation and the number of ISSI/CSSI connections that are available for future expansion.

2. OLD BRIDGE TOWNSHIP anticipates future ISSI connectivity to two other regional radio systems that at the TOWNSHIP's discretion will require ISSI operation.

3.8 System Reliability and Fault Tolerance

A. System reliability and fault tolerance shall be major objectives in the design of the system.

B. PROPOSER RFP shall ensure reliable operation of the system including, as a minimum, the voted simulcast system, trunked repeaters, system controllers, control channel, CSSI, ISSI and system management computer.

C. System shall be configured with two (2) system controllers both in hot stand-by fully capable of supporting seamless and redundant on-going reliable system operation in the event of failure. There shall be this level of redundant service at the system, site, console and backhaul level of operation.

D. The PROPOSER shall provide a detailed description, including features lost, of product operations that accomplish the reliability noted above.

3.9 Voice

A. The system shall support a fleet of at least 8,000 actively registered voice users.
B. The system shall support a minimum of 500 voice groups.

3.10 Subscriber Radio Functional Requirements

A. Unless otherwise stated, all control stations, mobiles, and portables shall meet the following functional requirements:

1. FCC type accepted at the time of the proposal submission.
2. The radio shall support digital voice trunking on any mixture of UHF or 700/800 MHz channels with 6.25 KHz/voice path equivalency.
3. All radios shall be capable of placing and receiving group and individual calls in trunking mode.
4. The radio shall have an emergency button and be capable of placing and receiving emergency calls and a keypad for use in all police/fire portable subscriber units.
5. The radio shall be capable of direct mode operation (talkaround - mobiles and portables only).
6. The radio shall be capable of sustained DAQ 3.4 in a high noise environment, including but not limited to, train rail platforms and such.
7. The radio shall be capable of selecting one of up to 128 voice "profiles". A profile is defined as a set of talkgroups and may correspond to different operational users, for example maintenance worker, supervisor, patrolman, etc. would each have different profiles. Non-emergency service subscribers will be provided with a version of radio most suitable to non-mission critical conditions.
8. The radio shall be capable of selecting any talkgroup from any assigned voice profile containing up to 128 profiles.
9. The radio shall be capable of scanning all talk groups within the profile, with the selected talk group having priority.

10. The radio shall provide the user with separate and discrete audible tones to indicate the status of differing call types.
11. The radio's personality shall be programmable through a standard Windows-based computer and through over-the-air signaling interface.
12. The radio software/firmware shall be flash updatable for adding future software enhancements through a standard Windows-based computer and through over-the-air signaling interface.
13. The radio shall include the capability to transmit and receive data through an external serial data port that conforms to RS-232 standard. Other industry standard interfaces may also be considered.
14. The radio shall contain an internal GPS receiver capable of sending GPS information through the radio's data transport capability for use by third party applications.
15. All subscriber equipment shall meet or exceed MIL-STD-810G as detailed in following section.
16. Subscriber equipment for buses and heavy equipment shall meet or be capable of meeting SAE J1455.
17. Proposer shall supply at least three (3) sets of all necessary software, cables and documentation for the programming of all subscriber equipment. Programming software compatibility shall be maintained at no additional cost to Old Bridge Township with the most up-to-date version of Microsoft Windows and shall be supported by the Manufacturer for a period of ten (10) years from System Acceptance.

B. The existence of an ESN (Electronic Serial Number) in a radio (subscriber unit) is to be mandatory. The validation response to an ESN inquiry is to be mandatory for authentication purposes.

C. All subscriber equipment shall:

1. Support all digital communications within this system.
2. Support direct mode operation between other system subscribers (talkaround). All subscriber equipment shall:
    a. Support both analog and Common Air Interface (P25) digital non-trunked communications in both the direct and repeater modes.
    b. Radios must operate in dual mode (analog, P25 conventional/P25 trunked) and must be software upgradable for P25 Phase 2 operation.

D. The radio shall be capable of sustain DAQ 3.4 in a high noise environment, including but not limited to, train rail platforms and such.

E. The radio shall support an optional Subscriber Unit Transmitter Inhibit Mode. This is an optional mode on portable and mobile equipment which when selected by the user would inhibit the transmitter under all conditions until the mode was deselected by the user. While in the transmitter inhibited mode, the receiver would still be capable of receive operation.

F. Radios shall be equipped with data port for external peripherals.

G. The subscriber equipment shall be able to sequentially scan user selectable scan list including both conventional channels and trunked talk-groups in both clear and encrypted voice (when equipped with encryption). The scan shall be selectable priority, which means that the transmitter channel or talk-group selected by the user is the priority channel or talk-group.

3.11 Audible Signaling

A. The subscriber units shall be able to support audible signaling to and from subscriber units for functions as described below.

B. Because of the inability to faithfully pass audio signaling through vocoders, audible signals shall use data messages that cause the receiving unit to generate standardized tone signals. These standardized tone signals correspond to a specific signaling command. Audible signals use data messages in the system to initiate audible signals both in the subscriber units and also in the consoles.

C. It is a mandatory requirement that users shall be able to select no audible signaling, or any or all of the default types of signaling described below. As a standard option, users may require alternative signals, which are subject to personality programming in the subscriber unit and/or in the console.

D. Audible signals may be operator-initiated or system-initiated. The mandatory, default audible signaling shall be limited to four standardized signals.

E. A multi-tiered audio alerting capability that includes, but is not limited to the following types of alerts:

1. Emergency – indicates the highest level of a declared emergency.
2. The Emergency alert shall be initiated by the operation of a momentary switch at the subscriber unit and may also be initiated by a console. It shall terminate after sending for a nominal two seconds regardless of how long the operator holds the switch.
3. Receipt of an Emergency alert at a console shall cause a latch up output for operation of external alarms. The console operator shall be able to release this latch.
4. A receiving subscriber unit shall continue to emit periodic Emergency signals reset by the operator or dispatcher.
5. Acknowledge – indicates an operator-designated affirmation of a request. This signal allows acknowledgment of a request without speaking. Acknowledge is initiated by the subscriber unit.
6. Message Alert – indicates that attention is needed to the message that follows.
7. The console operator shall initiate the Message Alert by initiating a momentary function or switch. The Message Alert tone shall continue in a repeating cycle until the operator releases the momentary function or switch.

F. The unit shall perform a self-diagnostic test each time it is turned on. This test shall be automatic and shall include all radio operating parameters. At the conclusion of a successful test, no operator intervention shall be required. A test that is not successful shall notify the operator.

G. Subscriber radios shall be available with an option for being intrinsically safe.

H. The proposed system shall provide GPS Location to support subscriber tracking capabilities for all subscriber types. Subscriber Tracking/GPS Location is defined as the service whereby a network control point or properly equipped dispatch console may monitor the real-time location of mobile or portable subscriber units (within coverage range of the proposed network) on a map display using the proposed network infrastructure. Manual user polling functionality shall be offered to provide real-time location status, and the location information shall be displayed on a map that updates at specified time intervals.

I. Additional triggers for location updates shall include: (1) emergency alert/call activation, (2) user PTT channel request, (3) dispatcher/administrator query, and (4) power-up/affiliation.

4. Equipment Requirements

4.1 **Trunked Repeater Sites**

A. The contents of this section define the network architecture, design, and or configuration criteria sought within this RFP. If the Proposer has an alternative architecture or configuration that will merit the consideration of Old Bridge Township, they must first satisfy the functional objective sought by the Township; shall take exception to the requirement stated herein; then they may describe the alternative methodology for the Township's consideration

B. General Repeater Site Requirements

1. Equipment provided at all three sites shall consist of site trunking controllers, digital repeaters, IP routers, and all other associated hardware and software for a digitally IP based trunked system.
2. The site trunking controllers and IP routers shall be based on off-the-shelf commercially available platform. The use of PROPOSER proprietary routers and switches hardware design is not acceptable.
3. All repeaters shall be interconnected to the site's IP switch using Ethernet connectivity. Each repeater will have a unique IP address.
4. All repeaters shall encode and decode the P25 CAI within the repeater. The use of an external P25 modem is not acceptable.

C. All repeaters shall be capable of being configured to provide trunked voice and data transmission to user radios.

1. All repeaters shall be capable of operating in the following modes: as a P25 digital control channel or as a P25 digital traffic channel; or as a P25 digital voice channel; or as an analog voice channel.
2. Repeaters shall be capable, through replacement of repeater firmware and through flashport of software, to be upgraded from P25 Phase I to P25 Phase II operation. If repeaters are upgraded to P25 Phase II capability, they shall be capable of automatically reverting to the proper duty mode, based on initiating talkgroup call type being P25 Phase I or P25 Phase II.
3. One repeater channel at each site shall provide automatic call sign identification that meets the FCC requirements for identifying trunked repeater sites.

D. The system shall provide the ability to reprogram and to download new software to individual repeaters and site controllers remotely through the network IP backhaul interface. The PROPOSER shall describe how repeater parameters and repeaters and site controller software's can be downloaded and configured remotely.

E. Trunked Repeater Control and Alarms

1. The trunked repeaters shall permit the system management computer to monitor the status of the following conditions at a minimum, and provide an automatic alarm to the system management computer if they are out of specification:
    a) High power amplifier temperature
    b) VSWR at RF output

F. Repeater Site Physical and Environmental

1. The trunked repeater sites, including repeater and site trunking controller, shall be housed in standard 19 inch EIA rack mount free standing cabinets, with four repeaters (or more) per cabinet to conserve space.

2. All hardware and software necessary for the stations to perform the trunking functions and to meet the system requirements shall be provided.
3. At a minimum the equipment shall be capable to operate over a controlled temperature range of +5 degrees to +40 degrees Celsius.
4. For remote sites, the repeaters shall operate over a temperature range of -30 degrees to + 60 degrees Celsius. All temperature sensitive specifications shall be referred to +25 degrees Celsius.
5. All components within the repeater shall be of solid state design.
6. The repeaters shall meet or exceed all applicable FCC requirements and fully comply with EIA standards as they apply to measurement of specifications.
7. The repeaters shall be operational under the environmental specifications listed in Table 4.1 below:

Table 3-1 Sheltered Base Site Environmental Specifications

Specification	Operating
Temperature	-30°C to +60°C (TIA/EIA 603 paragraph 4.3.2.2)
Vibration	10 Hz to 30 Hz: amplitude 0.07 mm total excursion 0.14 mm 30 Hz to 60 Hz: amplitude 0.04 mm total excursion 0.07 mm (TIA/EIA 603 paragraph 4.3.4.2)
Humidity	Up to 95% at +60°C (TIA/EIA 603 paragraph 4.3.3.2)

G. Antenna System

1. Transmitter combiners and receiver multi-couplers shall be installed in cabinets or open racks.
2. The RF equipment, antenna systems, transmission lines, and antenna support structures (tower), shelters, electrical and generator system upgrades shall meet, be designed, and installed in compliance with Motorola R-56, Harris 4618/1 R3A, MIL 188-124B or equivalent grounding and installation standards.
3. Work shall be conducted with no interruption of service to existing critical systems. Continuous and efficient operation of the current communications system shall be maintained without interruption or impairment of the existing operation.
4. Work shall be performed to insure that antenna systems and connectivity infrastructure meet and pass inspection of industry recognized grounding and installation standards and the requirements of the State Fire Codes and most recent building codes at no additional charge to the OLD BRIDGE TOWNSHIP for parts and/or labor.

5. Repeater Antennas
    a) All repeater antenna configurations shall be designed to provide the specified coverage.

6. Transmitter Combiner
    a) Due to the close frequency separation – 137.5 KHz -- between Channels 2 and 3 of the FCC authorized channels to Old Bridge Township Proposers shall describe the level of Transmitter to Transmitter isolation required between their repeaters, and the level of isolation provided by the combiner included in the design.

    b) Utilization of hybrid combiners shall only be permitted if the maximum permissible ERP authorized by the FCC to Old Bridge Township for each channel is not constrained by use of the combiner of choice.

    c) If Proposers design the antenna system such that two 3-channel cavity type combiners are better suited for the system, this design detail shall be clearly indicated in their proposal for proper consideration by Old Bridge Township, and for proper anticipation to locate additional antenna space on each tower site for the extra transmit antenna.

    d) The transmitter combiner shall be the expandable type supplied with twelve (12) ports and expandable in groups of four (4).

7. Receiver Multi-Coupler
    a) The receiver multi-coupler shall be the expandable type supplied with 12 (twelve) ports with all unused ports terminated with 50 ohms. A bandpass cavity filter shall be supplied with the multi-coupler to reject out-of-band RF signals.

8. Upon final acceptance of system operation, the PROPOSER shall dismantle and remove legacy cables and antenna from the existing tower sites.

H. Site Alarms

1. The system shall be capable of detecting the failure of all major equipment items at the repeater site, including the following items at a minimum. The PROPOSER must include method of detection in RFP document:
    a) Repeater Operation

    b) Trunking Controller Operation

    c) Status Of Leased Landline Or Microwave Link

    d) Status Of Antenna System (Vswr)

    e) Temperature Conditions

    f) Unauthorized Access

4.2 System Controller

A. The system controller shall provide intelligent wide area system control for voice and data communications and shall comprise the integrator component for interconnection of network controllers, repeaters sites, console subsystems and management subsystem.

B. The system controller configuration must have a primary and dual hot-standby controller functioning with full real-time service. The secondary controller will automatically take over full system operation when it detects failure or malfunction of the primary system controller. Upon failure of the primary system controller, wide area calls may be dropped however the secondary controller will come on-line with a fully replicated database enabling information about subscriber units to remain intact

C. The back up system controller shall be located at the Old Bridge Water Tank site.

The system controller shall be based on a high-performance commercial off-the-shelf server and shall provide features enhancements through system software releases as more P25 features are defined in the P25 standards.

The wide area system controller shall track each trunked radio and its affiliated talk group as it roams throughout the coverage area of the multi-site network. The controller shall route calls to the simulcast/voted receiver sites. The radio calls shall use IP simulcast and receive to be propagated to the appropriate sites. A Subscriber Unit shall be de-registered from the system after a programmable period of inactivity or if the Subscriber Unit turns off while in coverage.

D. The system controller shall be scalable to accommodate multiple P25 trunked radio sites, multiple P25 conventional radio channels, multiple dispatch consoles, voice logging recorder, data gateway, and system management computer.

E. Dual redundant power supplies must be capable of taking over operation with no degradation or interruption of service

F. Complete control over the system controller shall be provided to authorize persons through the system management computer.

G. The system controller shall support the P25 system interfaces for standards based conventional system level interoperability with all future P25 systems and consoles:

1. Inter RF Sub-System Interface (ISSI)
2. Console Sub-System Interface (CSSI)
3. The controller shall be powered from 115 VAC 60 Hz

H. The system controller shall be capable of interfacing to other P25 systems to track and authorize visitors and to establish interoperable communications with visitor's home RFSS. The interface shall meet all accepted ISSI standards.

I. The system shall support a minimum of four (4) ISSI/CSSI connections for future use in this system. PROPOSER shall state the number of:

1. ISSI/CSSI connections and the maximum number of concurrent and active (carrying voice traffic) talk-paths available in this system implementation.
2. ISSI/CSSI connections that are available for future expansion.

J. The controller shall be powered from 115 VAC 60 Hz. PROPOSER shall specify current requirements.

4.3 System Management

A. The system management software shall be client/server architecture and the management databases shall be integrated into the wide area system controller server to provide all system management functions.

B. The system shall include at least one system management console which provides system management of the entire system through the use of a standard Web browser interface.

C. The system shall be capable of supporting multiple system management operator consoles operating concurrently at different locations within the wide area network.

D. The system management consoles shall be powered from 115 VAC 60 Hz. PROPOSER shall specify current requirements.

E. System management software must be included with OTAR as an included feature.

F. Polling and Alarms

1. System devices which detect that they have changed status or are operating below specification shall automatically transmit an alarm to the system management server. In some cases device failure will prevent the transmission of an alarm; these situations will be detected through polling.

2. All attached network system devices shall support SNMP version 2 managers and standards.

G. Network Topology Map

1. The system management computer shall provide a hierarchical network topology map, showing all managed devices using color coding to represent device status.

2. Through the network topology map it shall be possible for the operator to determine the current detailed status of a managed object, by double clicking on the object.

H. Fault Browser

1. The system management computer shall provide a scrollable, time sorted list of alarm messages sent by managed objects.

I. Audible Alert

1. It should be expected that due to the high reliability of the system, the system management computer console will be unattended most of the time with the operator working in the area on other tasks.

2. The system management computer shall provide a programmable audible alert to notify the operator of changes in the system status.

J. System Partitioning and System Security

1. The system management function shall be capable of partitioning the database such that different managers (e.g. supervisor vs. non-supervisor) have control only over the units and groups for which they have been authorized.

2. The system management function shall have multiple levels of security access. All encryption in the system shall be 256 AES as a minimum.

3. The system management function shall keep a log of all entries into the system by date, time, and authorized individual.

K. Map System Administration

1. The system management computer shall support establishing and updating repeater site parameters, and remotely enabling and disabling radios.

2. The system management computer shall support the registration of new voice and data users in the system and assigning voice group membership.

L. Call Activity Logging

1. The purpose of this feature is to determine the relative traffic loading and geographic distribution for each of the voice groups using the system. This can be used for billing different user groups, and in engineering the system for increased busy hour capacity.

2. The system management function shall maintain a record on hard disk of all voice call activity for a period of up to 45 days, with the capability to down load to other storage media when desired.

3. The system management function shall be able to continue to log call activity when a report is being run, and when downloading to the supported storage media.

4. The following data should be stored as a minimum:

a) Date, time, and duration of call

b) Type of call (group, selective, emergency)

c) Unit initiating call and voice group number (group calls only)

d) Unit initiating call and target unit number (selective calls only)

e) Repeaters and/or consoles participating in the call

f) SU airtime

g) The number of minutes by site that all of the channels are busy

M. Remote Diagnostics

1. The system management function shall permit the operator to run remote diagnostics on managed devices to isolate and trouble-shoot faults.

4.4 Subscriber Units / Console Equipment Requirements

A. OLD BRIDGE TOWNSHIP intends to purchase the end user subscriber radios and accessories for operation on the proposed system as part of this process. Information regarding current and projected end user subscriber radio counts, desired subscriber radio capabilities, capacities and configurations is provided in this RFP to assist PROPOSERs in developing a system design and submitting RFPs for a Project 25 trunked radio system that will meet OLD BRIDGE TOWNSHIP current and future requirements.

B. The PROPOSERs shall list a minimum of five (5) P25 subscriber radio models of different manufacturers reflecting a range of feature capabilities for various user groups. All models must be have been tested and proven to be compatible with the proposed system. In addition, the PROPOSERs shall describe the testing methodology that was done beyond the CAP testing.

C. Fire/EMS Subscriber Unit Requirements

1. Each Fire and EMS agency has a variety of radio communications needs. Both fire and EMS disciplines require dual band mobile and portable radios. Dual band capabilities for Fire service in 800MHz and VHF 150-170 MHZ; UHF 450-512 MHz. EMS needs include capabilities in 800MHz and VHF bands. The mobile units for Fire and EMS radios include a mix of dash mount, and remote mount. Both mobile and portable radios require multi-system non-proprietary P25 encryption capabilities.

2. The dash mount radio shall include a remote amplified speaker and mobile remote mount units require a control head, speaker and microphone. Some fire apparatus require this equipment to be water proof so that it can be mounted near the pump panels. Portable radios must meet MIL Standard 810 C, D, E, F & G and must be dual band for both fire and EMS. Each apparatus will also require portable radio chargers that are vehicle mounted. Portable accessories requirements include a high visibility colors, spare battery, and remote microphone for each radio.

4.5 Required Equipment Quantities—For Design Information Only

a) Table 4.5-1: Fire and EMS Inventory Requirements

Agency	Personnel Portable		Mobile Radio Dual Head			Mobile Radio Dash Mount			Dual Band Control Stations	Single Band Control Stations	Ext Speakers	External Mic	Rear Control Units	Portable Chargers		Marine Radio
	800/VHF	**800/ UHF**	**800/ VHF**	**800/UHF**	**800 Only**	**800/VHF**	**800/UHF**	**800 Only**	**800/UHF**	**800 Only**				**Desk Top**	**Vehicle**	
Fire Service and EMS	47	97	1	22	0	15	29	2	13	4	68	19	26	75	69	1

b) Table 4.5-2: Police and Other Township Departments Inventory Requirements

Agency	Personnel Portable		Mobile Radio Dual Head		Control Stations with Power Supplies	External Speakers	Portable Chargers	
	800/UHF	**800**	**800/UHF**	**800 Only**			**Desktop**	**Vehicle**
Old Bridge Police Dept.	9	137	3	73	5	73		20
Utility Grade Subscribers Other Township Agencies (office of aging, DPW and Health)		9		38	9	38		
Total By Type	9	146	3	111	14	111		20

4.6 Radio Equipment Specifications

A. Base Stations

1. Digital base stations shall be P25 Phase 1 required, Phase 2 upgradeable.
2. Transmitter, receiver, power supply and all other equipment necessary for remote control operation shall be contained in a single cabinet unit.
3. Stations requiring field modifications to ensure compatibility will not be acceptable.
4. The control chassis located in the base station cabinet shall be of modular construction to facilitate the addition of options.
5. Local control functions accessible at the equipment cabinet shall include:
    a) RS-232, RJ-45/RJ-48, or USB computer interface connection
    b) Line level
    c) Temperature
6. Remote control functions shall include but not be limited to:
    a) Transmitter keying
    b) Base station on/off (disable)

B. Radio Equipment Specifications – Transmitter

1. Base station transmitters shall comply with Part 90 of the FCC Rules and appropriate EIA and similar agency standards and be FCC type accepted for the proposed frequency band(s).
2. Technical specifications for Transmitter
    a) Output frequency 760-890 MHz
    b) RF output power 25 - 100 Watts, adjustable.
    c) Duty cycle 100 percent (Continuous Duty).
    d) Frequency stability 1 ppm with external reference.
    e) Channel Spacing 12.5 kHz (P25 Phase 2 Upgradeable)
    f) Output impedance 50 ohms.
    g) Maximum deviation 5 kHz.
    h) Audio sensitivity adjustable to -35 dBm
    i) Spurious and harmonics -85 dBc
    j) FM hum and noise (audio) 25 kHz: -50 dB
    k) 5 kHz: - 45 dB
3. Analog audio distortion 2 percent maximum @ 1,000 Hz
4. Analog audio response +1 -3 dB (6 dB pre emphasis) from 300 to 3,000Hz.

C. Radio Equipment Specifications – Transmitter Combiners

1. Technical specifications for Transmitter Combiners:

   a) Frequency range: 760-890 MHz

   b) Isolation - tx to tx 65 dB min

   c) Isolation - antenna to rx 50 dB min

   d) Input power per channel 100 watts RF

   e) Output power - combined 500 watts RF

   f) Maximum Separation Dependent upon antenna bandwidth

   g) Minimum Separation Dependent upon frequencies used

   h) VSWR 1.3: 1 or better

   i) Must support a minimum of 8 100 watt TDMA 12.5 Khz transmitters operating in the 6.25Khz equivalent mode

D. Radio Equipment Specifications – Receiver

1. Base Station receivers shall comply with Part 90 of the FCC Rules and appropriate EIA and similar agency standards and be FCC type accepted for the proposed frequency band.
2. Base station receiver implementation shall include an analysis of the electromagnetic environment at the receiver antenna location that includes the assumption of all collocated transmitters operating simultaneously.
3. Technical specifications for Receiver:

   a) Input frequency 760-890 MHz

   b) Frequency stability 1 ppm with external reference

   c) 12 dB SINAD sensitivity 0.35 microVolts

   d) 5 percent static BER sensitivity 0.35 microVolts

   e) Channel Spacing 12.5 kHz

   f) Input impedance 50 ohms

   g) Adjacent channel rejection 12.5 kHz 75 dB

   h) Pre-selector bandwidth 4 MHz

   i) Intermod rejection 85 dB

   j) Spurious & image rejection 85 dB

   k) Analog audio response +1,-3 dB (6 dB de-emphasis) 300 to 3,000Hz

   l) Analog audio distortion 5 percent @ 12.5 kHz

m) FM hum and noise (audio) 12.5 kHz -45 dB

E. Radio Equipment Specifications – Receiver Multi-Couplers

1. Technical specifications for Receiver Multi-Couplers:
    a) Channel capability 8 to 16 expandable
    b) Bandwidth 12 MHz
    c) System Gain 10 dB
    d) Noise Figure 2.5 dB (max)
    e) Third Order Intercept +24 dBm
    f) Power input 120 VAC.

F. Radio Frequency Console System

1. PROPOSER will provide and install four (4) IP radio frequency consoles at the existing Dispatch Center They shall be Windows 7/8 based operating systems and will provide control of 24 radio channels as a minimum. They shall support P25 ISSI technology and they shall utilize both select and unselected audio channels.
2. Proposers are to include 2 console options for consideration. One in the base proposal and an alternate that can meet the requirements of these specifications and there intended operation.
3. Approved manufacturers:
    a) Motorola MCC 7500
    b) Harris Symphony
    c) Zetron Amcon/Max
    d) AVTEC SCOUT
4. All console positions shall provide the functions and devices as shown below. Depending on the manufacturer, this could be a virtual machine.
    a) PC or computer-based console systems must contain solid state hard drives to reduce ambient noise.

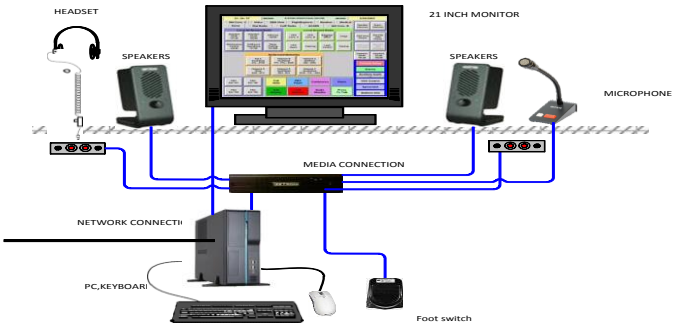


Figure 3. Frequency Console Position

G. Subscriber Units

1. PROPOSER shall provide a unit price for control stations, portables and mobile radio units in the following formats:
    a) 700/800 MHz P25
    b) VHF 700/800 MHz P25
    c) UHF 700/800 MHz P25
    d) VHF Low-band
2. All Fire and Police portable subscriber units shall have a display and keypad. Units shall support both digital and analog communications.
3. All non-emergency portable and subscriber units shall be considered ‘utility grade’ and do not need encryption or any extra functionality that keypads would support.
4. Final quantities shall be determined by OLD BRIDGE TOWNSHIP.

5. SHELTER, GENERATOR, AND UPS REQUIREMENTS

5.1 Scope of Work

A. Proposers shall be required to prepare as many as four (4) sites in Old Bridge Township to facilitate installation of equipment as shown in the table below.

Site	Site Name	Latitude	Longitude	Ground Elevation ASL (ft)	Antenna Height AGL (ft)
1	Old Bridge Plaza	40:24:13.4 N	74:17:51.5	98	180
2	GSP Exit 120	40:26:04.4 N	74:15:05.5 W	114	100
3	Old Bridge Water Tower	40:21:59.6 N	74:19:16.0 W	125	106
4	Cheesequake Volunteer Fire Station	40:25:36.12N	74:17:35.26W	108	150

Table 2 Possible Sites in Old Bridge Township for which site work will be required

B. Township designated personnel will work with the Proposer to obtain permission to access facilities where required. Township designated personnel must be present when Proposers communicate with site owners.

C. An overview of the scope of work necessary at each site is depicted below. In general, the Proposer shall be responsible for the following:

1. Procurement and installation of all materials necessary to complete the work
2. Submittal for approval of all details cuts and drawings of equipment and control systems.
3. Disposal and removal from the site of all debris and refuse as the result of performing this work. Proposers may provide, as an option, the overall project cost reduction if the Township is responsible for debris and refuse removal and disposal.
4. Obtaining all required permits. The Township will assist the Proposer in obtaining all required permits.
5. Compliance with all codes in accordance with the requirements set forth in the specifications.

D. The subsections below include the Township's estimation of the work needed to be performed by the Proposer. However, the Proposers are still required to submit their own detailed SOW based on the field survey results. The final SOW may differ from the estimated SOWs provided in the subsections below.

5.2 Communications Center and the Old Bridge Plaza Tower Site

A. This site is the Communications Center facility located in Old Bridge Plaza. It has a co-located tower – the Old Bridge Plaza Tower -- with line of site communications to both the GSP Exit 120 site and the Old Bridge Water Tower Site. Proposers shall survey two equipment rooms associated with this site: (a) the equipment room in the bottom floor of the Police Department which currently contains racks of console electronics; and (b) the equipment room inside the shelter adjacent to the self-supporting tower.

B. It is contemplated that common network equipment, such as network control equipment, servers, gateways, IP core equipment and console interface equipment will be installed in an equipment room located inside of the Police Department. Transceiver equipment, meanwhile, shall be installed in the equipment shelter adjacent to the Tower. Proposers shall survey all equipment rooms at this facility to determine site upgrade needs and requirements.

C. Generally the work consists of the following:

1. Utilize existing tower.
    a) Tower is heavily loaded. Proposers shall include the cost to perform a stress analysis on the tower.
2. Utilize existing outdoor equipment shelter.
    a) Approximate size of the shelter is 12'x 12'
    b) Floor space in the shelter is mostly utilized with racks which support the existing system. It may be possible to install two additional equipment racks for use as swing space.
    c) Two (2) one hundred amp electrical panels are currently installed.
3. First panel is full
4. Second panel has room for three (3) additional 15 A circuit breakers
    a) The shelter is currently equipped with primary and backup outdoor HVAC systems. Proposer shall replace both the primary and backup HVAC with new HVAC systems
5. Backup Power
    a) This site shall not require a new backup generator or transfer switch.
    b) Proposers shall include UPS appropriately sized to supply 30 minutes of uninterrupted power.
6. Grounding and bonding
    a) Grounding and Bonding was installed at this site in accordance to Motorola R-56 standards, however, the installation has aged.
    b) Proposers shall check the existing grounding and bonding elements to ensure that all materials, connections, straps, and pigtails are in accordance to current standards, and shall replace all materials as necessary.
    c) Proposers shall measure the overall site resistivity using industry standard clamp-on Ohmmeter test equipment and shall furnish ground resistivity following equipment installations as part of acceptance testing.
7. Equipment room inside, on ground floor of Police Department facility
    a) This room currently contains the console electronics in open racks
    b) Floor space in the equipment room largely available.
    c) Proposers shall survey the cable paths for connecting any equipment installed in this room that must be interfaced to dispatch consoles or to the outdoor shelter.
    d) Proposers shall include UPS appropriately sized to supply 30 minutes of uninterrupted power for all equipment placed inside this equipment room.
    e) Proposers shall include HVAC equipment from proper ventilation and air conditioning of the equipment located in this room (building HVAC is not available for this room)

5.3 Garden State Parkway Exit 120 Site

A. An existing 100'monopole tower is located near exit 120 just off the Garden State Parkway. This site has line of site communications to both the Old Bridge Plaza tower and the Cheesequake

Fire Station tower located on Route 34. This site is part of the existing system and it is expected that this site can be used as an RF simulcast site to provide coverage for the north and central portion of the Township. The Township has their equipment shelter at this site with underground conduits connecting transmission lines to the tower. Proposers shall include in their proposal the materials and labor necessary to trench new conduit from the shelter to the tower, or investigate the feasibility to install a cable bridge as the existing conduits will not support running additional cable.

B. Proposers shall survey all equipment and physical plant equipment at this facility to determine site upgrade needs and requirements

C. Generally the work consists of the following:

1. Utilize existing tower.

a) tower is top loaded with cellular panel antenna arrays.

b) Proposers shall include the cost to perform a stress analysis on the tower.

2. Utilize existing outdoor equipment shelter.

a) Approximate size of the shelter is 12' x 12'

b) Floor space in the shelter includes two (2) open racks which support the existing system. Sufficient space is available for installation of additional equipment racks for use as swing space.

c) A two hundred amp electrical service panel has plenty of capacity for installation of additional circuit breakers.

d) The shelter is currently equipped with primary and backup outdoor HVAC systems. Proposer shall replace both the primary and backup HVAC with new HVAC systems.

3. Backup Power

a) Proposers shall provide a new 20 KVA diesel fuel generator for this site.

b) Proposers shall provide a new transfer switch.

c) Proposers shall include UPS appropriately sized to supply 30 minutes of uninterrupted power.

d) Three (3) unused existing UPS cabinets and batteries shall be removed and properly disposed by Proposer.

4. Grounding and bonding

a) Grounding and Bonding was installed at this site in accordance to Motorola R-56 standards, however, Proposers shall install a new outside ground ring system which shall be properly tied to the interior ground system.

b) Proposers shall check the existing interior grounding and bonding elements to ensure that all materials, connections, straps, and pigtails are in accordance to current standards, and shall replace all materials as necessary.

c) Proposers shall measure the overall site resistivity using industry standard clamp-on Ohmmeter test equipment and shall furnish ground resistivity following equipment installations as part of acceptance testing.

5.4 Cheesequake Volunteer Fire Station

A. An existing 150' self-supporting tower is located behind the Cheesequake Volunteer Fire Station on Route 34 North. This site has line of site communications to both the GSP Exit 120 tower and the Old Bridge Water tower. This site is supplemental to the existing system and

shall be used only for microwave transport. Proposers shall survey all equipment and physical plant equipment at this facility to determine site upgrade needs and requirements.

B. Generally the work consists of the following:

1. Utilize existing tower.
    a) Tower is top loaded with cellular panel antenna arrays.
    b) Proposers shall include the cost to perform a stress analysis on the tower.
2. Utilize existing outdoor equipment shelter.
    a) Approximate size of the shelter is 12' x 12'
    b) Floor space in the shelter includes one equipment rack and one base station cabinet. Sufficient space is available for installation of additional equipment racks.
    c) A one hundred amp electrical service panel has plenty of capacity for installation of additional circuit breakers.
    d) Proposers shall supply sufficient primary and backup outdoor HVAC systems for this site.
3. Backup Power
    a) The site is equipped with an existing Kohler natural gas generator
    b) Proposers shall include in their proposal materials and labor to perform a complete service on the existing natural gas generator and provide all necessary repairs as needed.
    c) Proposers shall test the capacity of the existing generator and shall ensure proper operation and support thereof.
    d) Proposers shall provide a new transfer switch for this site.
    e) Proposers shall include UPS appropriately sized to supply 30 minutes of uninterrupted power.
4. Grounding and bonding
    a) Complete grounding and bonding for this site must be installed in accordance to Motorola R-56 standards, or approved equal.
    b) Proposers shall measure the overall site resistivity using industry standard clamp-on Ohmmeter test equipment and shall furnish ground resistivity following equipment installations as part of acceptance testing.

5.5 Old Bridge Water Tower

A. This site is an existing 100'water tower and is located on Greystone Rd. This site will be shared with the New Jersey Transit Corporation. This site has line of site communications to both the Cheesequake Fire Station tower and the Old Bridge Plaza tower. This site is supplemental to the existing system and shall be used as an RF simulcast site to provide coverage for the south and southwest portion of the Township. NJ TRANSIT will supply this site with an equipment shelter and with underground conduits to connect transmission lines to the tower. Proposers shall use the shelter and the underground cable conduits installed by NJ TRANSIT.

B. Site plans for this facility are included in this section following the text.

C. Generally the work consists of the following:

1. Utilize existing water tower.
2. Utilize NJ TRANSIT supplied outdoor equipment shelter.

a) Approximate size of the shelter is 20' x 12'; Old Bridge Township shall have use of approximately 10'x12', or half the size of the shelter

b) A new two hundred amp electrical service panel shall be provided.

c) New HVAC systems for this site shall be provided.

3. Backup Power

a) The site shall be equipped with a new 60 KVA diesel fuel generator and transfer switch.

b) Proposers shall include UPS appropriately sized to supply 30 minutes of uninterrupted power.

4. Grounding and bonding

a) Complete grounding and bonding for this site must be installed in accordance to Motorola R-56 standards, or approved equal.

b) Proposers shall measure the overall site resistivity using industry standard clamp-on Ohmmeter test equipment and shall furnish ground resistivity following equipment installations as part of acceptance testing.

5.6 General Requirements

A. The following information shall be submitted following contract signing:

1. Product Data: description literature, product cut sheets:

a) Power line surge suppression equipment

b) HVAC equipment

i. Manufacturer qualifications

ii. Installer qualifications

iii. Warranties

iv. Equipment lists and layout drawings including antenna entry port location, cable tray layout and floor penetration locations

v. Acceptance Test Plan

vi. Periodic maintenance schedule for included equipment

c) Upon completion of the work, the PROPOSER shall provide to the Owner:

i. Two complete sets of all final design and as-built drawings, ANSI C size or larger

ii. CD-ROM with all design and as-built drawing files in both AutoCad 2000 format and Adobe Acrobat (.pdf) format

iii. Final inspection and testing report

iv. Maintenance data

5.7 Uninterruptable Power Supply System

A. Each shelter (4) shall be equipped with an uninterruptible power supply with 240 Volt output, having sufficient capacity as determined by the needs of the Proposer's equipment, and the ability to supply power to critical circuits for no less than 30 minutes under full rated load.

B. The UPS shall be served by a 240VAC, 100 Amp circuit from the main distribution panel. It shall supply a separate critical power distribution panel, with a maximum continuous rating of 73 Amps under a load power factor of at least 0.7 (leading).

C. The UPS storage batteries shall be maintenance free, sealed, gas recombinant, valve regulated lead-acid type, designed for UPS service conditions. The nominal battery string voltage shall be 120 Volts and each string shall be individually fused for short circuit protection. The UPS unit shall be supplied with a charging system which is capable of completely recharging the batteries from a fully discharged state in three hours or less. Storage batteries for the UPS shall be housed in a separate housing to allow disconnection and service without removing inverter cabinet covers.

D. The UPS shall have an isolated output and be regulated and protected from overload using ferroresonant technology. The output voltage shall be sinusoidal, with less than 5% total harmonic distortion under all rated load conditions. The UPS output shall be 240VAC, 60 Hz and regulated to within 3% for normal load and battery conditions. Total voltage regulation under any line, load, or battery condition shall be within -8% to +5%. The output shall be connected to provide a separately derived power source to sensitive electronic equipment and transient surge suppression devices.

E. Each UPS system shall be supplied with external switches for AC input disconnect, DC power disconnect, and UPS output bypass to allow isolation and removal of the UPS unit or batteries without interruption of loads, if desired.

F. The UPS shall be capable of 150% surge overload. It shall be capable of operating at overload condition for 10 minutes at up to 125% during normal (on line) operation, or 110% when operating on inverter power with nominal battery voltage input. Apparent power output shall be continuously monitored by microprocessor and shall provide an alarm prior to loss of output regulation.

G. Output frequency during online operation shall track input frequency within 0.005 Hz as long as the input power frequency is within the limits of 57-63 Hz. In the absence of adequate input voltage, or when input power frequency varies beyond these limits, the unit shall switch to inverter power and maintain frequency within 0.005 Hz of rated frequency under all rated load conditions.

H. The UPS shall provide attenuation of input voltage spikes. It shall be of a design which has been successfully tested using ANSI/IEEE C62.41 Category A (6000 volt spike and 200 amp) and Category B (6000 volt spike and 3000 amp), and ANSI/IEEE C62.45 procedures.

I. The UPS system shall operate reliably over an ambient temperature range of -20o to +40 o Centigrade and relative humidity of 0-95% (non-condensing), Internal fans shall circulate air for inverter and charger cooling.

J. The UPS shall provide visual, audible, and external alarms for overvoltage, undervoltage, overload, shutdown, and inverter operation conditions. The UPS shall include a monitoring and control keypad and display, and shall also include either an RS232 or USB serial connection for external monitoring and control. The monitoring system shall include an even history log to record input power quality, as well as alarms. The monitoring system shall be capable of monitoring and displaying: input AC voltage and frequency; Battery voltage and current (charging or sourcing); output voltage, current, real and apparent power; power factor, and percentage of output capacity; ambient, heatsink, and transformer temperatures; number of power loss events, operating hours, and inverter power runtime in hours; and approximate remaining run time in minutes.

K. The UPS shall automatically shut down under fault conditions of continued overload, low battery voltage, and other situations or fault conditions that would otherwise result in

permanent damage to the UPS or connected equipment. The UPS shall also provide facilities for remote shutdown by contact closure or terminal command.

L. The UPS shall be installed and connected, configured and started by a factory authorized technician. Startup testing shall include a full report of tests performed, including the results of a witnessed runtime test under full load after installation.

M. A bypass switch shall be installed between the main distribution panel and the critical load distribution panel to allow the UPS to be removed for maintenance or replaced in its entirety

N. A critical load distribution panel shall be furnished and installed that will be fed by the UPS

5.8 Wiring Methods

A. General

1. All wiring noted on the site drawings or otherwise included by the PROPOSER shall be installed in conduit or ductwork. Where no protection method is specified, conduit shall be used.
2. PVC or other non-metallic conduit is not permitted within the structure for electrical wiring.
3. All conduits and ducts shall be securely mounted and supported by approved clamps, brackets, or straps as applicable and held in place with properly selected screws.
4. All wire raceway, conduit, etc., is to be mechanically joined and secured.
5. Flexible steel conduit or armored cable shall protect wiring connected to motors, fans, etc., and other short runs where rigid conduit is not practical.
6. Conduit shall not be solely used as a ground of any kind. Separate ground wires shall be used for all grounding functions. More specific grounding requirements are stated elsewhere within this specification.

B. Minimum Wiring

1. Unless otherwise approved, all power wiring shall be minimum size 12 AWG copper conductors with THHN/THWN type insulation.
2. All wiring shall be sized in accordance with applicable prevailing code requirements.

5.9 HVAC Systems

A. Low ambient temperature air conditioning equipment shall be provided for the electronic equipment room. Electric heat strips or other devices shall be provided which will maintain the interior temperature of both rooms of the shelter between 55 and 85 degrees Fahrenheit when outside temperatures are -5 degrees Fahrenheit. Relative humidity shall be maintained at a level acceptable to the equipment to be furnished in this procurement.

B. There shall be two, minimum 3 ton, external vertical wall mount air conditioning units installed with a standard lead/lag switch arrangement set to cycle between the two units.

C. The electronic equipment shelter generator room shall be equipped with cool air intake and hot air exhaust vents designed to meet the environmental specification of the generator manufacturer. Fresh air intake and radiator heat exhaust vents shall be protected by screened rain hoods.

D. The generator room shall be maintained at a temperature suitable for operation of the engine generator, and at no time shall the minimum temperature be lower than 40 degrees F and the maximum temperature higher than 120 degrees F. At a minimum, an auxiliary exhaust fan system shall be installed in the generator room including motorized louvers, thermostat, timer, and hood with permanent expanded metal dust filter and exhaust insect screen.

5.10 Alarms

A. The following alarm inputs shall be installed and connected to a Siemon PK-50, or equivalent, 66 block kit equipped with bus bar assemblies, ground plates, and brackets compatible with Siemon Pico Protectors, or equivalent. Cabling will be connected to this block and routed to the input of the microwave alarm and network management system.

1. Fire/Smoke Detectors
2. Intrusion Alarm
3. High Temperature Alarm
4. Low Temperature Alarm
5. Power Failure Alarm
6. Automatic Transfer Switch Alarm
7. Generator in Operation
8. UPS Alarm
9. Surge Arrestor Alarms (2)
10. Tower Light Failure
11. Air conditioner compressor lockout
12. Dehydrator alarms:
13. Power fail
14. Low pressure
15. High humidity
16. Excess run
17. The Siemon PK-50, or equivalent, at each site shall be provided with a supply of six spare fuses and six TP4P adapters for test access.
18. The punch blocks shall be grounded to the Master Ground Bar using #6AWG solid tinned copper wire and the appropriate two hole ground lug and hardware

5.11 Generator:

A. The Electrical Contractor shall supply and install a pad mounted diesel generator at the GSP Exit 120 tower site. The generator shall be installed in a weather resistant NEMA enclosure suitable for operation in the local conditions on a 12 month basis. The generator shall be installed in accordance with local regulations and meet NFPA/NEC standards and codes. The installation shall be approved by the Contractor's engineer and OLD BRIDGE TOWNSHIP.

B. The generator assembly shall be equipped with an exterior mounted automatic transfer switch to supply power to the onsite radio equipment upon commercial power failure and sustain operations for no less than 48 hours.

C. Automatic Transfer Switch

1. An automatic transfer switch ("ATS") which provides switching of the equipment shelter electrical load between commercial power and generator power shall be furnished and supplied in each of the four equipment shelters. Indoor installation shall be provided in each shelter.

2. The transfer switch shall be completely factory assembled and shall contain electronic controls designed for surge voltage isolation, with voltage sensors on all phases of both input power sources. Permanently attached manual handles shall also be installed on the transfer switch for operation under de-energized conditions. The switch shall provide positive mechanical and electrical interlocking and mechanically held contacts. Quick-make and quick-break contact mechanisms shall be provided for manual transfer under load.
3. Functions to be provided by the automatic transfer switch include:
   a) Continuous monitoring of the utility power feed
   b) Sensing of unacceptable power – undervoltage, overvoltage, over/under frequency, loss of a phase, voltage imbalance/phase rotation
   c) Automatic inception of generator start and delay sequence
   d) Timer for unacceptable power condition, and to switch the load only when the engine speed has stabilized and output voltage stabilizes
   e) Automatic transfer of load to the generator set after the transfer time threshold has been met
   f) Sense the return of normal utility power with a timed delay to retransfer the load after the utility source has stabilized
   g) Provide a minimum run time for the generator once it has started
   h) Retransfer the load to the utility source immediately if the generator set is inadvertently shut off
   i) Provide inrush current management in a high harmonic environment to allow the use of:
      i. UPS at each site
      ii. HVAC motor in lead/lag configuration at each site.
4. The transfer switch shall be installed in a key locking, UL listed, NEMA cabinet to be mounted on a wall in the generator room of the electronic equipment shelter. The switch shall be fully wired and integrated with the engine generator set in accordance with the National Electrical Code and applicable local electrical and fire codes.
5. All transfer switches and accessories shall be listed by Underwriters Laboratory and labeled, tested per Underwriters Laboratory Standard 1008 and CSA Approved. The generator shall be capable of providing a minimum of **20 Kva at a 200 ampere** load

D. Compliance to Standards

1. The generator shall comply with NFPA 110 Standard for Emergency and Standby Power Systems.
2. The generator and associated subsystems shall be Underwriters Laboratory 2200 listed.
3. Battery chargers shall be Underwriters Laboratory 1236 listed.
4. Electrical installation shall comply with the NFPA 70 National Electrical Code of the latest revision.
5. The control system for the generator shall be UL508 listed.
6. Engine block coolant heater shall be UL499 listed.

7. The alternator shall comply with the relevant sections of NEMA MG1-2003 or later revision.

E. Start-Up Service

1. A factory authorized service representative shall provide initial start up service of each generator system and shall conduct acceptance testing in the presence of County representatives at each site at which the equipment is installed. Written test records shall be furnished to the County.

F. Type of Generator

1. The generator shall be a diesel fueled, four cycle, liquid cooled (closed, recirculating type), engine driven set with low reactance, brushless generator. The generator set shall be equipped with a temperature compensated automatic voltage regulator with under speed protection function, a control panel, and high ambient temperature cooling system.

2. The AC generator shall be synchronous, four pole, 2/3 pitch stator, revolving field, drip-proof construction, air cooled with a centrifugal blower fan, and shall be directly connected to the engine. The temperature rise for the generator, using the resistance method at full load, shall not exceed 80 degrees Celsius.

G. Output Power

1. 40 kW, with minimum continuous output power rating of the generator shall be 32,000 Watts; full load current 200 Amps at 120/240 Volts A.C., 60 Hertz. The generator shall be capable of full single phase output @ 1.0 pf.

2. Ambient Temperatures: Equipment will either be mounted outdoors, or in an equipment shelter room that is not air conditioned. The system shall be rated for operation in ambient temperatures of 104 degrees F, measured at the generator air inlet. Derating of the engine power due to higher ambient temperature must be taken into account in application of a particular product to this specification.

3. Voltage Regulation: Random voltage variation of not more than +/- .5% of rated voltage for constant load between no load and full load

4. Frequency Regulation: Isochronous .6% from steady state no load to steady state rated load

5. Single Step Load Pickup: 100% of rated output power, less applicable derating factors, with the engine -generator at operating temperature.

6. Motor starting: HVAC systems, 3 ton air conditioners (2) per site in lead/lag configuration

7. Harmonic distortion: Maximum 5% Total Harmonic Distortion at full linear load, not more than 3% in any harmonic.

H. Generator Set Control

1. The generator shall be equipped with digital, microprocessor controls that are compatible with an IP based network management system. Controls shall be enclosed and protected from oil and dust, with access from a door equipped with gaskets to maintain the integrity of the controls. Controls shall be vibration isolated designed to withstand vibration from the motor generator operation.

2. Controls shall be provided for remote start/stop compatible with the automatic transfer switch to be supplied pursuant to this procurement. Manual starting and stopping shall also be provided from the generator control panel.

3. Voltage regulation shall be provided within +/- 1% under no-load to full load or under random voltage variation conditions.
4. Cranking control: Starters shall provide a minimum of three cranking cycles of at least 15 seconds without overheating and before lockout and activation of an overcrank alarm condition.
5. Generator Protection Controls: (per NFPA 110)
6. The generator shall provide warnings, shut down, and lockout as follows:
7. Failure to start (overcrank)
8. Over speed shutdown
9. Low lubricating oil pressure – warning and shutdown
10. High oil temperature – warning
11. Oil pressure sender failure - warning
12. High and low battery voltage warning
13. Low coolant level warning or shutdown
14. Low coolant temperature warning
15. High coolant temperature warning and shutdown
16. Engine temperature sender failure - warning
17. Low DC voltage – warning
18. High DC voltage – warning
19. High AC voltage – warning
20. Low AC voltage - warning
21. Weak battery warning – battery monitoring system to indicate low voltage after start – recharge time
22. Failure to crank – shutdown
23. Redundant start disconnect
24. Cranking lockout
25. Under frequency – shutdown
26. Over current – warning
27. Over current – shutdown
28. Short circuit – shutdown
29. Over load – warning
30. Emergency stop - shutdown
31. Sensor failure indication
32. A control system shall be provided that is accessible via a local area network to provide control and diagnostics. Client software for use in accessing the control system shall be provided, or alternatively, a web browser based solution may be provided.
33. Alarm contacts shall be provided to allow transmission of fault alarms for any of the above conditions, plus low oil pressure pre-warning, high coolant temperature pre-

warning, low coolant temperature, low fuel pressure and an alarm indication when the generator set is running. These alarm contacts shall be wired into and shall be reported by the alarm system being supplied by Motorola.

34. Digital metering shall be provided to indicate:
35. RMS voltage and current
36. Frequency
37. Output power
38. Output current
39. Running time in hours
40. Power factor

I. Generator Battery and Charger

1. A low maintenance lead acid starting battery rated for the engine type to be supplied shall be furnished and installed with the generator set. The battery shall be mounted in a protective non-corrosive case secured to the generator base. This battery shall be float charged by a properly sized voltage regulated charger which is powered by 120 VAC. Float, taper and equalize charge settings shall be provided. The battery charger shall be mounted in the automatic transfer switch housing.
2. Form C alarm contacts shall be provided and connected to the microwave alarm system to report loss of AC commercial power, low battery voltage, high battery voltage, and commercial power on.

J. Cooling System

1. A radiator cooled engine is required. The cooling system shall be sized for the environment in which the generator will be installed. The radiator shall be filled with a water and coolant mixture in accordance with the engine manufacturer's recommendations.
2. A flexible radiator shroud duct connector and duct shall be provided which shall be attached to a motorized ventilation duct to the outside of the equipment shelter to exhaust engine heat.
3. A motor driven air intake vent shall be supplied in the equipment shelter generator room which will automatically open on generator activation to provide cool air intake into the room at a volume sufficient to meet the specifications of the generator manufacturer.
4. Ducts and vents shall be protected with screens to minimize entry into the shelter of insects or birds.
5. A thermostatically controlled water jacket coolant heater shall be provided and installed in accordance with the manufacturer's recommendations and in accordance with the requirements of NFPA 110. The coolant heater shall be installed using quick disconnect couplers that permit the heater to be replaced without draining the engine coolant.
6. Rotating parts, such as fans and belts shall be protected with guards or shrouds to prevent accidental contact by persons near the generator.

5.12 Electrical Work and Transient Protection

A. Each half of every duplex outlet shall have its own dedicated individual 20-ampere branch circuit, provided the connecting tabs on the receptacles are removed.

B. Each receptacle shall have the electrical box or cover plate permanently marked with the circuit number and appropriate breaker identification. Each half of every duplex outlet shall have its own dedicated individual 20-ampere branch circuit, provided the connecting tabs on the receptacles are removed.

1. All AC powered equipment to be installed in equipment shelters or rooms shall be equipped with a surge arrestor, MOV/gas tube combination, in addition to any surge protection equipment that may be installed across the shelter/room power mains.

2. For any electrical work required to accommodate new equipment installations, Proposer shall comply with the following requirements:

a) All Electrical outlets shall be120-volt, 20-ampere (NEMA 5-20R) capacity receptacles with ground shall be provided.

b) The color of all receptacles shall be gray.

C. Each half of every duplex outlet shall have its own dedicated individual 20 ampere branch circuit, provided the connecting tabs on the receptacles are removed.

D. Each receptacle shall have the electrical box or cover plate permanently marked with the circuit number and appropriate breaker identification.

E. Antenna Cable Conduit Entry

1. All conduit openings in the shelter walls shall align properly with the antenna entrance cables.

2. A solid copper bulkhead entry panel, such as Polyphaser PB-M type, shall be supplied to accommodate coaxial transmission lines between 1/2-inch and 1

3. 5/8-inch diameter elliptical waveguides. The feed-through shall provide a minimum of 16, four-inch ports. Polyphaser PEEP or equivalent shall not be accepted

4. The PROPOSER shall seal the conduits into the wall to assure that they are watertight.

F. Cable Tray

1. The PROPOSER shall install an 18-inch wide cable tray system above the equipment and below the ceiling.

2. The bottom of the cable tray shall be installed 8 feet above finished floor.

3. The PROPOSER shall bond all cable ladder sections to the interior grounding system per Section 2.9.

4. The cable tray shall run up to the transmission line entry and extend in two parallel trays the length of the shelter.

5.13 Grounding and Bonding System

A. General

Interior ground system shall be Motorola R-56, Harris 4618/1 R3A, MIL 188-124B and consistent with all other grounding used for the installation of all systems in this RFP document.

1. The internal perimeter ground (IPGB) bus shall consist of #2 AWG tinned bare solid copper conductor with no splices, running along the shelter wall, at a height of 8’ feet above the finished floor of the shelter and a minimum of 12 inches below the ceiling. An IPGB shall be installed in of the equipment shelter. Two separate ground buses shall be installed on opposite sides of the shelter, each of which is grounded to the master ground bar. A gap of not less than four inches shall be provided between the two IPGB’s.

2. The IPGB shall be supported by insulated mounting standoffs that will maintain spacing from the shelter wall of 2 ½, Stainless steel standoffs with insulating rubber grommet devices shall be installed every 2 feet horizontally or as required to accommodate gradual bends and to avoid sag of the ground wire.

3. The IPGB shall be grounded to the shelter Master Ground Bar using dual lug compression type ground connectors and the two proper size bolts and hardware for the drilled hole pattern of the bus bar. Lock washers shall be installed on the nut side of the ground bar. No washers shall be used on the bolt head side of the ground bar.

4. All connections to Internal Perimeter Ground Buses shall be made as straight as possible with a minimum number of bends using irreversible crimp connections. Minimum bending radius of any ground wire shall be one foot.

B. External Ground Ring

1. A ground ring consisting of a #2 AWG solid tinned bare copper wire shall be installed in a trench at a depth of 30" below final grade or below the frost line (whichever is lower) at a minimum distance of 3 feet from the foundation of the building where the equipment is installed. The intent of the ground ring is to provide a low inductance connection to driven ground rods.

2. If soil conditions allow, the ground ring shall be supplemented with copper clad steel ground rods. The ground rods shall have a minimum length of 8 feet and a minimum diameter of 5/8 inches. The use of ground rods will insure contact with unfrozen soil during the winter season. All ground rods shall be interconnected including the AC power service and telephone ground rods to form a ground grid of 5 ohms or less.

3. The minimum requirements for the quantity of ground rods shall be based on the following:

    a) At least one ground rod at each corner of the shelter shall be installed

    b) The minimum distance between rods shall be 16 feet (using 8 foot ground rods)

4. At least one ground rod shall be installed directly below the transmission line entry port for connection to the shelter master ground bar and cable entry port ground bar.

5. The ground rods shall be bonded to the external shelter ground ring using an exothermic welding process, for example, Cadweld.

6. It will be left to the discretion of the PROPOSER to determine the type of mold/connector to use in the exothermic welding process. The following two restrictions, however, shall be observed.

    a) An anti-oxidant compound shall be applied to the connection point after the bond is completed.

    b) All connections to the ground ring shall be such that the ground wires are as straight as possible avoiding sharp bends.

C. Master Ground Bar Inside Shelter

An internal Master Ground Bar minimum dimensions ¼” deep X 4” tall X 24” wide, Harger model TGBIT14424M2T or equivalent, shall be installed such that it is located directly beneath the transmission line entry port. The ground bar shall be wall-mounted on insulators. The ground bar shall be made of tinned copper, and shall be drilled with 63 holes that provides hole spacing on the master ground bar to accommodate type “B”, “C”, and “D” two hole lugs. A minimum 25 foot exothermically welded #2 AWG solid copper tinned wire “tail” shall be installed

on the ground bar and shall be connected to the external ground bar on the outside of the shelter. The master ground bar shall be directly connected to the Internal Perimeter Ground Bus halo using #2 AWG copper conductor.

5.14 Fire Protection

A. The shelters shall have two installed portable fire extinguishers with minimal sizing as:
    1. 20 pound Class ABC dry chemical extinguisher
    2. 7 pound Class BC carbon dioxide extinguisher
B. Fire extinguishers shall meet the requirements of NFPA 10 and any local regulations including all ANSI and UL testing and performance standards.
C. Fire extinguishers shall be clearly marked and securely installed in the brackets supplied and properly anchored to the mounting surface in accordance with manufacturer's instructions.

5.15 Safety Equipment

A. Safety equipment shall be permanently located inside the shelter including a fire extinguisher and safety lights in the event power is disrupted.

SITE NAME:
OLD BRIDGE WATER TOWER

VICINITY MAP SCALE: 1"=2000'

SITE NAME:	OLD BRIDGE WATER TOWER
SITE ADDRESS:	421 EAST GREYSTONE ROAD OLD BRIDGE, NJ 08857
PROPERTY OWNER:	OLD BRIDGE MUNICIPAL UTILITIES AUTHORITY 71 BOULEVARD WEST CLIFFORD BEACH, NJ 07735
APPLICANT:	NJ TRANSIT 1 PENN PLAZA EAST NEWARK, NJ 07105
COORDINATES:	LATITUDE: N40° 21' 59"± LONGITUDE: W74° 19' 16"
GROUND ELEVATION:	19'± AMSL

PROJECT SUMMARY

SHEET NUMBER	DESCRIPTION	REVISION DATE
T-1	TITLE SHEET	02/21/14
S-1	SITE PLAN	02/21/14
S-2	ELEVATION & ROOF PLAN	02/21/14
GN-1	GENERAL NOTES	02/21/14

SHEET INDEX

NJ TRANSIT:	CARMINE DeFALCO 973-491-7959
ENGINEER:	PETER E. PAPAY P.E. 201-934-2828
ALCATEL-LUCENT	PAT McSHERRY 267-981-5668
OLD BRIDGE MUNICIPAL UTILITIES AUTHORITY	MICHAEL ROY 732-679-8440

PROJECT CONTACTS

NJTRANSIT
1 PENN PLAZA EAST
NEWARK, NEW JERSEY 07105
OFFICE: (973) 491-7000

APPROVALS

PROJECT NO. 2744
DRAWN BY: T.A.
CHECKED BY: P.E.P.

SUBMITALS

DATE	DESCRIPTION	NO.
02/21/14	PRELIMINARY	0

SCALE: AS SHOWN

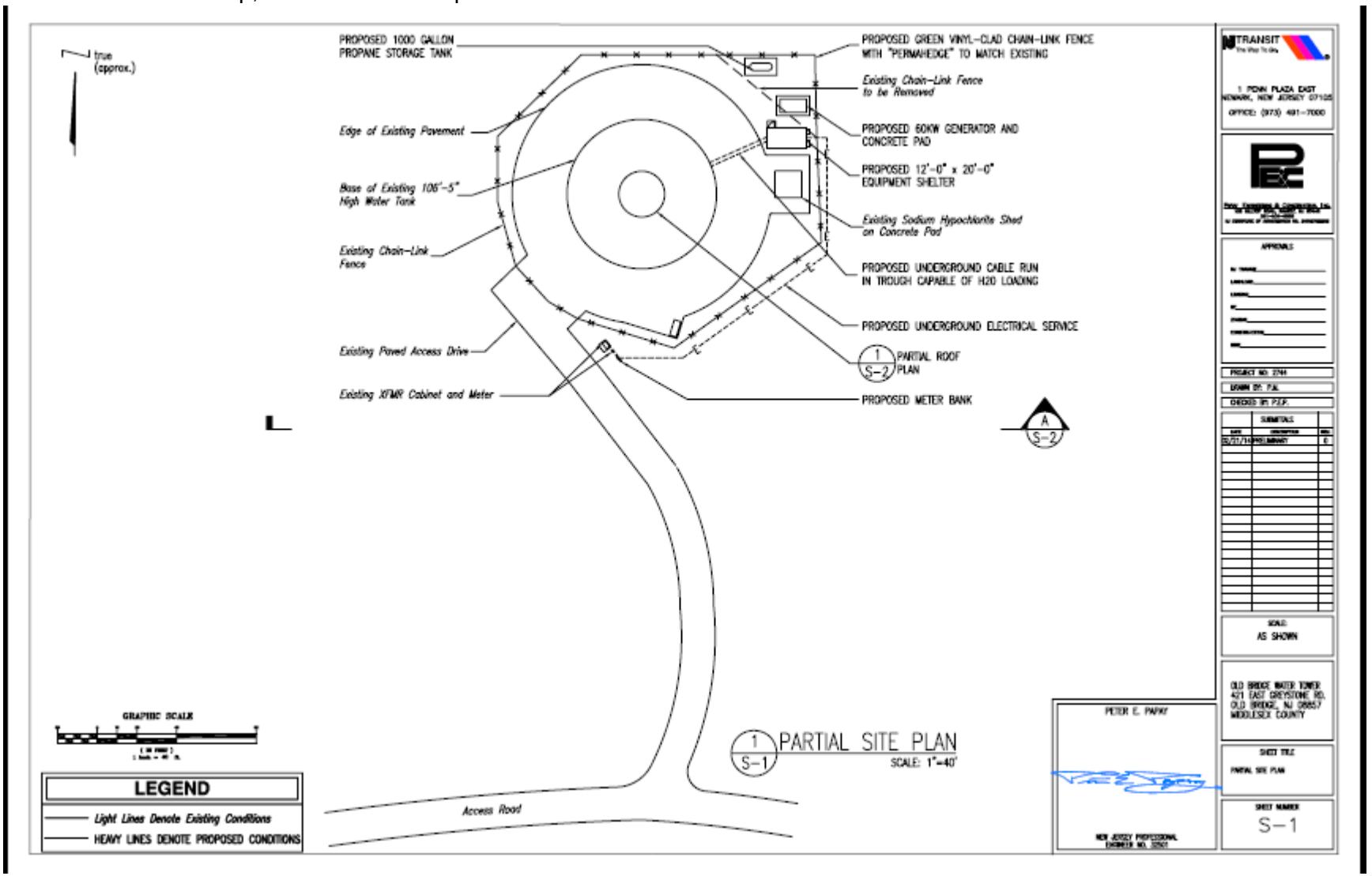
OLD BRIDGE WATER TOWER
421 EAST GREYSTONE RD.
OLD BRIDGE, NJ 08857
MIDDLESEX COUNTY

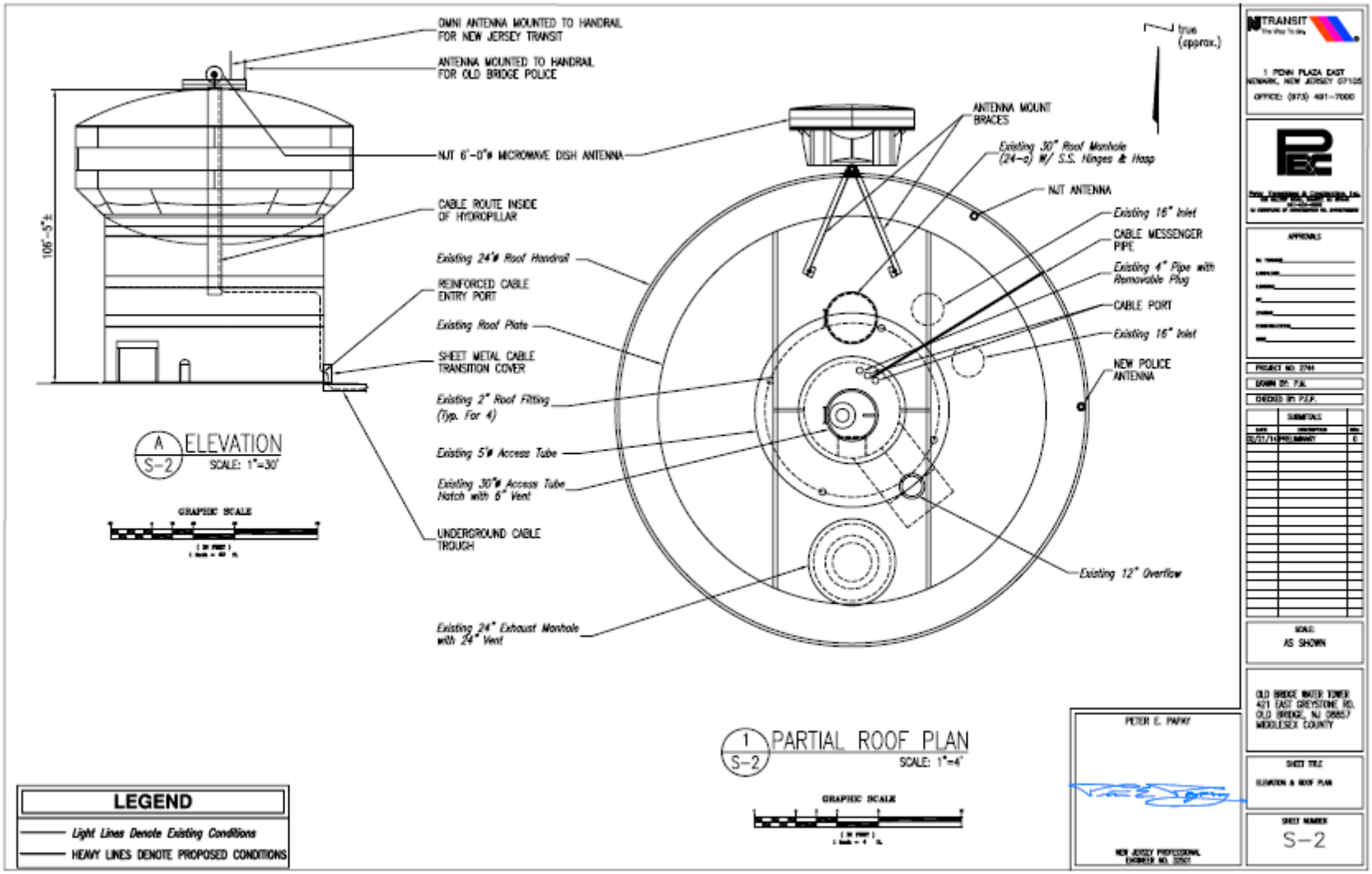
SHEET TITLE: TITLE SHEET

SHEET NUMBER: T-1

PETER E. PAPAY

NEW JERSEY PROFESSIONAL ENGINEER NO. 32507


true
(approx.)
PROPOSED 1000 GALLON
PROPANE STORAGE TANK
PROPOSED GREEN VINYL-CLAD CHAIN-LINK FENCE
WITH "PERMAHEDGE" TO MATCH EXISTING
Existing Chain-Link Fence
to be Removed
Edge of Existing Pavement
PROPOSED 60KW GENERATOR AND
CONCRETE PAD
PROPOSED 12'-0" x 20'-0"
EQUIPMENT SHELTER
Base of Existing 105'-5"
High Water Tank
Existing Sodium Hypochlorite Shed
on Concrete Pad
Existing Chain-Link
Fence
PROPOSED UNDERGROUND CABLE RUN
IN TROUGH CAPABLE OF H20 LOADING
PROPOSED UNDERGROUND ELECTRICAL SERVICE
Existing Paved Access Drive
1
S-2
PARTIAL ROOF
PLAN
Existing XFMR Cabinet and Meter
PROPOSED METER BANK
A
S-2
GRAPHIC SCALE
LEGEND
Light Lines Denote Existing Conditions
HEAVY LINES DENOTE PROPOSED CONDITIONS
Access Road
1
S-1
PARTIAL SITE PLAN
SCALE: 1"=40'
NJTRANSIT
1 PENN PLAZA EAST
NEWARK, NEW JERSEY 07105
OFFICE: (973) 491-7000
APPROVALS
PROJECT NO: 2741
DRAWN BY: P.M.
CHECKED BY: P.E.P.
SUBMITALS
DATE
DESCRIPTION
REV.
05/21/14
PRELIMINARY
0
SCALE:
AS SHOWN
OLD BRIDGE WATER TOWER
421 EAST GREYSTONE RD.
OLD BRIDGE, NJ 08857
MIDDLESEX COUNTY
SHEET TITLE
PARTIAL SITE PLAN
SHEET NUMBER
S-1
PETER E. PAPAY
NEW JERSEY PROFESSIONAL
ENGINEER NO. 32501


OMNI ANTENNA MOUNTED TO HANDRAIL FOR NEW JERSEY TRANSIT
ANTENNA MOUNTED TO HANDRAIL FOR OLD BRIDGE POLICE
NJT 6'-0"ø MICROWAVE DISH ANTENNA
CABLE ROUTE INSIDE OF HYDROPILLAR
Existing 24"ø Roof Handrail
REINFORCED CABLE ENTRY PORT
Existing Roof Plate
SHEET METAL CABLE TRANSITION COVER
Existing 2" Roof Fitting (Typ. For 4)
Existing 5'ø Access Tube
Existing 30"ø Access Tube Hatch with 6" Vent
UNDERGROUND CABLE TROUGH
Existing 24" Exhaust Manhole with 24" Vent
106'-5"±
A S-2 ELEVATION
SCALE: 1"=30'
GRAPHIC SCALE
ANTENNA MOUNT BRACES
Existing 30" Roof Manhole (24-ø) W/ S.S. Hinges & Hasp
NJT ANTENNA
Existing 16" Inlet
CABLE MESSENGER PIPE
Existing 4" Pipe with Removable Plug
CABLE PORT
Existing 16" Inlet
NEW POLICE ANTENNA
Existing 12" Overflow
1 S-2 PARTIAL ROOF PLAN
SCALE: 1"=4'
GRAPHIC SCALE
LEGEND
Light Lines Denote Existing Conditions
HEAVY LINES DENOTE PROPOSED CONDITIONS
true (approx.)
TRANSIT
1 PENN PLAZA EAST
NEWARK, NEW JERSEY 07105
OFFICE: (973) 491-7000
APPROVALS
PROJECT NO. 2744
DRAWN BY: P.H.
CHECKED BY: P.E.P.
SUBMITTALS
DATE DESCRIPTION NO.
12/21/14 PRELIMINARY 0
SCALE:
AS SHOWN
OLD BRIDGE WATER TOWER
421 EAST GREYSTONE RD.
OLD BRIDGE, NJ 08857
MIDDLESEX COUNTY
SHEET TITLE
ELEVATION & ROOF PLAN
SHEET NUMBER
S-2
PETER E. PAPAY
NEW JERSEY PROFESSIONAL ENGINEER NO. 32507

1. THE EXISTING FACILITY IS UN-MANNED AND VISITED APPROXIMATELY ONCE A MONTH FOR ROUTINE MAINTENANCE. THEREFORE, POTABLE WATER, GAS AND SANITARY SEWER SERVICES ARE NOT REQUIRED NOR PROPOSED. NO SOLID WASTE IS GENERATED.

2. PLANS ARE NOT TO BE SCALED. THESE PLANS ARE INTENDED TO BE A DIAGRAMMATIC OUTLINE ONLY UNLESS OTHERWISE NOTED. THE WORK SHALL INCLUDE FURNISHING ALL MATERIALS, EQUIPMENT, APPURTENANCES, LABOR AND TEMPORARY MEASURES NECESSARY TO EFFECT ALL INSTALLATIONS AS INDICATED ON THE CONTRACT DOCUMENTS.

3. PRIOR TO THE SUBMISSION OF A BID, THE CONTRACTOR SHALL VISIT THE PROJECT SITE AND FAMILIARIZE HIMSELF WITH ALL CONDITIONS AFFECTING THE GENERAL CONSTRUCTION AND INSTALLATION OF ALL PROPOSED MATERIALS AND EQUIPMENT AND REMOVAL/ DEMOLITION OF EXISTING ITEMS SHOWN. THE CONTRACTOR SHALL MAKE PROVISIONS FOR THE COST OF SUCH CONDITIONS. CONTRACTOR SHALL BE RESPONSIBLE FOR FAMILIARIZING HIMSELF WITH ALL CONTRACT DOCUMENTS, FIELD CONDITIONS AND DIMENSIONS. SUBMISSION OF A BID BY THE CONTRACTOR GUARANTEES THAT ALL WORK MAY BE ACCOMPLISHED AS DEPICTED ON THE CONTRACT DOCUMENTS.

4. DIMENSIONS SHOWN ARE TO FINISH SURFACES UNLESS OTHERWISE NOTED. SPACING BETWEEN EQUIPMENT IS REQUIRED CLEARANCE. THEREFORE, IT IS CRITICAL TO FIELD VERIFY ALL DIMENSIONS. SHOULD THERE BE ANY QUESTIONS REGARDING THE CONTRACT DOCUMENTS, EXISTING CONDITIONS OR DESIGN INTENT, THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING WRITTEN CLARIFICATION FROM THE CONSTRUCTION MANAGER PRIOR TO PROCEEDING WITH THE WORK.

5. THE CONTRACTOR SHALL OBTAIN ALL CLARIFICATIONS AND AUTHORIZATIONS IN WRITING BEFORE STARTING WORK ON ANY ITEM NOT CLEARLY DEFINED OR IDENTIFIED BY THE CONTRACT DOCUMENTS.

6. INSTALL ALL EQUIPMENT AND MATERIALS IN ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS, UNLESS SPECIFICALLY OTHERWISE INDICATED OR WHERE LOCAL CODES OR REGULATIONS TAKE PRECEDENCE.

7. THE CONTRACTOR SHALL NOTIFY THE CONSTRUCTION MANAGER OF ALL PRODUCTS OR ITEMS NOTED AS "EXISTING" WHICH ARE NOT FOUND TO BE IN THE FIELD.

8. ALL WORK PERFORMED AND MATERIALS INSTALLED SHALL BE IN STRICT ACCORDANCE WITH ALL APPLICABLE CODES, REGULATIONS AND ORDINANCES HAVING JURISDICTION. CONTRACTOR SHALL GIVE ALL NOTICES AND COMPLY WITH ALL LAWS, ORDINANCES, RULES, REGULATIONS AND LAWFUL ORDERS OF ANY PUBLIC AUTHORITY BEARING ON THE PERFORMANCE AND EXECUTION OF THE WORK. ELECTRICAL SYSTEMS SHALL BE INSTALLED IN ACCORDANCE WITH ALL APPLICABLE MUNICIPAL AND STATE JURISDICTIONAL CODES, THE NATIONAL ELECTRICAL CODE, AND UTILITY COMPANY SPECIFICATIONS.

9. ALL WORK SHALL BE PERFORMED IN STRICT ACCORDANCE WITH ALL CITY, STATE AND O.S.H.A. SAFETY REQUIREMENTS.

10. ALL ITEMS REQUIRING INSPECTION SHALL BE INSPECTED AND APPROVED PRIOR TO CONCEALMENT OF SUCH ITEMS.

11. DURING THE COURSE OF THE WORK, THE PROPERTY OWNER(S), HIS EMPLOYEES, SUPPLIERS, CLIENTS, TENANTS AND VISITORS SHALL CONTINUE TO OCCUPY AND USE THE FACILITY AND PREMISES. THE CONTRACTOR SHALL SCHEDULE AND COORDINATE THE WORK ACCORDINGLY.

12. THE DESIGN, SPECIFICATION, PERFORMANCE AND INSTALLATION OF RADIO EQUIPMENT ARE THE RESPONSIBILITY OF OTHERS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING HIS WORK WITH THE WORK OF OTHERS AS IT MAY RELATE TO RADIO EQUIPMENT AND OTHER PORTIONS OF THE WORK WHICH ARE PERFORMED BY OTHERS.

13. SEAL ALL PENETRATIONS THROUGH FIRE RATED ASSEMBLIES WITH U.L. LISTED AND FIRE CODE APPROVED MATERIALS. ALL EXTERIOR PENETRATIONS SHALL BE WEATHERPROOF.

14. DETAILS ARE INTENDED TO SHOW END RESULT OF DESIGN. MINOR MODIFICATIONS MAY BE REQUIRED TO SUIT JOB DIMENSIONS OR CONDITIONS. SUCH MODIFICATIONS SHALL BE INCLUDED AS PART OF THE WORK.

15. THE CONTRACTOR SHALL MAKE ALL NECESSARY PROVISIONS TO PROTECT ALL EXISTING AREAS OF THE PROJECT SITE FROM DAMAGE MADE BY THE HANDLING OF MATERIALS, EQUIPMENT, TOOLS AND NORMAL CONSTRUCTION ACTIVITY FOR THE DURATION OF THE WORK. ALL EFFECTED AREAS SHALL BE RESTORED TO THEIR ORIGINAL CONDITION UPON COMPLETION OF THE WORK.

16. KEEP PROJECT AREA CLEAN AND HAZARD FREE THROUGHOUT THE DURATION OF THE WORK. DISPOSE OF ALL DEBRIS, RUBBISH, EQUIPMENT REMOVED AND NOT SPECIFIED TO REMAIN ON THE PROPERTY OF THE OWNER. LEAVE PREMISES IN A FIRST CLASS CLEAN CONDITION, FREE FROM PAINT SPOTS, DUST, OR SMUDGES OF ANY NATURE. REPAIR AND PAINT ALL EXISTING SURFACES THAT HAVE BEEN DAMAGED OR OTHERWISE EFFECTED BY THE WORK SUCH THAT THEY BLEND WITH ADJACENT SURFACES.

17. THE CONTRACTOR SHALL PERFORM ALL CUTTING AND PATCHING AS REQUIRED TO PROVIDE ACCESS FOR THE INSTALLATION OF VARIOUS PARTS OF THE WORK. ALL HOLES IN MASONRY OR CONCRETE SURFACES SHALL BE CORE-DRILLED OR SAW-CUT. ALL CUTS SHALL BE LOCATED AND EXECUTED SUCH THAT THE STRUCTURAL INTEGRITY OF THE SURFACE IS NOT COMPROMISED.

18. DO NOT DEVIATE FROM MANUFACTURERS LISTED WITHIN THE CONTRACT DOCUMENTS, UNLESS UNAVAILABLE. OBTAIN PRIOR APPROVAL FROM CONSTRUCTION MANAGER FOR SUCH DEVIATIONS.

19. THE CONTRACTOR IS THE DESIGNATED "RESPONSIBLE PERSON IN CHARGE OF CONSTRUCTION" AND THE SITE SUPERVISOR RESPONSIBLE FOR CONSTRUCTION SITE SAFETY DURING THE COURSE OF SITE IMPROVEMENTS PURSUANT TO N.J.A.C. 5:23-2.21 (c) AND (e) OF THE N. J. UNIFORM CONSTRUCTION CODE.

20. DELIVER ALL MAINTENANCE AND INSTRUCTION MANUALS AND SPARE PARTS TO THE CONSTRUCTION MANAGER.

21. ALL MATERIALS AND WORKMANSHIP PROVIDED UNDER THIS CONTRACT SHALL BE GUARANTEED TO BE FREE FROM DEFECTS FOR A PERIOD OF ONE YEAR AFTER SUBSTANTIAL COMPLETION, OR LONGER IF OFFERED BY EQUIPMENT MANUFACTURERS OR REQUIRED ELSEWHERE WITHIN THE CONTRACT DOCUMENTS. ANY DEFICIENCIES THAT BECOME EVIDENT DURING THE GUARANTEE PERIOD SHALL BE CORRECTED TO THE SATISFACTION OF THE CONSTRUCTION MANAGER AT THE CONTRACTOR'S EXPENSE. ALL EXISTING ROOF OR OTHER BUILDING WARRANTIES SHALL REMAIN IN EFFECT AND INTACT DURING THE COURSE OF THE WORK. THE CONTRACTOR SHALL COORDINATE WITH SAID GUARANTOR(S) SUCH THAT THOSE WARRANTIES ARE MAINTAINED.

22. LOCATE AND MARK-OUT ALL UNDERGROUND UTILITIES AND STRUCTURES THROUGH THE USE OF A UTILITY LOCATING SERVICE PRIOR TO ANY EXCAVATION WORK. HAND DIG IN AREAS OF EXISTING UTILITIES AND/OR STRUCTURES.

23. THIS SET OF PLANS SHALL NOT BE USED FOR CONSTRUCTION UNTIL IT HAS BEEN DEPICTED AS SUCH IN THE ISSUE BLOCK.

24. ALL WORK SHALL COMPLY WITH THE NEW JERSEY UNIFORM CONSTRUCTION CODE AND THE NATIONAL ELECTRICAL CODE.

25. ALL CONDUCTORS SHALL BE COPPER. MINIMUM CONDUCTOR SIZE SHALL BE #12 AWG., UNLESS OTHERWISE NOTED. CONDUCTORS SHALL BE TYPE THWN, RATED IN ACCORDANCE WITH NEC 110-14(c).

26. ALL CIRCUIT BREAKERS, FUSES AND ELECTRICAL EQUIPMENT SHALL HAVE AN INTERRUPTING RATING NOT LESS THE MAXIMUM INTERRUPTING CURRENT TO WHICH THEY MAY BE SUBJECTED, AND A MINIMUM OF 10,000 A.I.C. SERVICE EQUIPMENT SHALL WITHSTAND FAULT CURRENT ESTABLISHED BY THE UTILITY.

27. THE ENTIRE ELECTRICAL AND ANTENNA INSTALLATION SHALL BE GROUNDED IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE, ARTICLES 250 & 810, THE UTILITY COMPANY STANDARDS, AND THE RADIO EQUIPMENT MANUFACTURER'S REQUIREMENTS.

28. INTERIOR RECEPTACLES SHALL BE NEMA 5-20R, HUBBELL #5362, BROWN. WEATHERPROOF, GFI RECEPTACLES SHALL BE HUBBELL #GF5352, WITH WP26 COVER AND BELL BOX. INTERIOR RECEPTACLE BOXES SHALL BE 4" X 4".

29. MINIMUM CONDUIT SIZE SHALL BE 3/4" TRADE DIAMETER, EXCEPT FOR TELEPHONE CONDUIT. TELCO CONDUIT RUN IN/ON BUILDINGS SHALL BE 2"ø AND HAVE MINIMUM 12" RADIUS BENDS AND ELBOWS. CONDUIT RUNS SHALL HAVE ONE 18" X 18" X 8" PULL BOX AFTER 270° OF BEND WITH A MAXIMUM OF 360° OF BEND PER RUN. STRAIGHT RUNS SHALL HAVE A PULL BOX AFTER EACH 75 FEET OF STRAIGHT RUN. CONDUIT RUN UNDERGROUND FROM SITE BOUNDARY (POLES, ETC.) TO TELCO BACKBOARDS OR DIRECT TO PPC MIN. SHALL BE 4"ø SCHEDULE 40 PVC WITH MINIMUM 3 FOOT RADIUS SWEEPS AND ELBOWS AT BENDS. PULL ROPES SHALL BE INSTALLED IN ALL TELCO CONDUIT.

30. CONDUIT:

a. RIGID CONDUIT SHALL BE U.L. LABEL GALVANIZED ZINC COATED WITH ZINC INTERIOR AND SHALL BE USED WHEN INSTALLED IN OR UNDER CONCRETE SLABS, IN CONTACT WITH THE EARTH, UNDER PUBLIC ROADWAYS, IN MASONRY WALLS OR EXPOSED ON BUILDING EXTERIOR. RIGID CONDUIT IN CONTACT WITH EARTH SHALL BE 1/2 LAPPED WRAPPED WITH HUNTS WRAP PROCESS NO. 3. ALL FITTINGS SHALL BE THREADED. THREADLESS CONNECTIONS ARE PROHIBITED.

b. ELECTRICAL METALLIC TUBING SHALL BE U.L. LABELED. FITTINGS SHALL BE GLAND RING COMPRESSION TYPE. EMT SHALL BE USED ONLY FOR INTERIOR RUNS.

c. LIQUID-TIGHT FLEXIBLE METAL CONDUIT SHALL BE U.L. LISTED AND SHALL BE USED AT FINAL CONNECTIONS TO EQUIPMENT & RECTIFIERS AND WHERE PERMITTED BY CODE. ALL CONDUIT IN EXCESS OF SIX FEET IN LENGTH SHALL CONTAIN A FULL-SIZE GROUND CONDUCTOR.

d. CONDUIT RUNS SHALL BE SURFACE MOUNTED ON CEILINGS OR WALLS UNLESS NOTED OTHERWISE. ALL CONDUIT SHALL RUN PARALLEL OR PERPENDICULAR TO WALLS, FLOOR, CEILING, OR BEAMS. VERIFY EXACT ROUTING OF ALL EXPOSED CONDUIT WITH THE CONSTRUCTION MANAGER PRIOR TO INSTALLING.

e. PVC CONDUIT MAY BE PROVIDED ONLY WHERE SHOWN, OR IN UNDERGROUND INSTALLATIONS. PROVIDE UV-RESISTANT CONDUIT WHERE EXPOSED TO THE ATMOSPHERE. PROVIDE GROUND CONDUCTOR IN ALL PVC RUNS, EXCEPT WHERE PERMITTED BY CODE TO OMIT.

31. ALL ELECTRICAL EQUIPMENT SHALL BE LABELED WITH PERMANENT ENGRAVED PLASTIC LABELS. BACKGROUND SHALL BE BLACK WITH WHITE LETTERS; EXCEPT AS REQUIRED BY CODE TO FOLLOW A DIFFERENT SCHEME.

32. IF USED, EXTERIOR GROUNDING RODS SHALL BE BURIED TO A MINIMUM DEPTH OF 2'-6" BELOW FINISH GRADE TO TOP. ELECTRIC METER GROUND EXCEPTED. SPACE GROUND RODS 15'-0" O/C MAXIMUM AND 8'-0" O/C MINIMUM.

33. STANDARD GROUND RODS SHALL BE 5/8"ø, 8' LONG, COPPER CLAD. CHEMICAL GROUND RODS SHALL BE ERICO OR APPROVED EQUAL.

34. GROUNDING CONDUCTORS:

a. SHALL BE COPPER; SOLID & TINNED OR STRANDED & GREEN INSULATED AS SHOWN HEREIN.

b. SHALL HAVE A MINIMUM BENDING RADIUS OF 12".

c. SHALL BE ROUTED IN THE MOST-DIRECT, DOWNWARD PATH TO GROUND. ROUTE GROUND CONDUCTORS WITH ANTENNA CABLES, WHERE PRACTICAL. ROUTE CONNECTIONS BETWEEN PRODUCERS AND ACCEPTORS IN A CLOCKWISE DIRECTIONAL BOND.

d. WHERE ABOVE-GRADE CONDUCTORS PIERCE THE EARTH, A PVC CONDUIT SHALL SURROUND THE CONDUCTOR AND EXTEND 12" ABOVE AND 12" BELOW GRADE. SEAL TOP.

35. GROUNDING CONNECTIONS:

a. SHALL BE EXOTHERMIC TYPE, CADWELD OR EQUAL AT ALL BELOW GRADE LOCATIONS, AT ALL ANTENNA SUPPORTS, AT ALL FENCE POSTS, AT ALL CABLE BRIDGE POSTS AND AT MONOPOLE/TOWER STEEL LOCATIONS.

b. SHALL BE COMPRESSION-TYPE, TWO-HOLE, LONG BARREL, WITH STAINLESS STEEL HARDWARE AND ANTI-OXIDANT COMPOUND AT GROUND BARS AND AT ALL OTHER LOCATIONS.

c. WHEN MADE BETWEEN DISSIMILAR METALS, SHALL BE MADE COMPATIBLE THROUGH THE USE OF COPPER-LADEN JOINT COMPOUND AND INTERMEDIATE MATERIALS.

36. METALLIC CONDUIT CARRYING GROUNDING CONDUCTORS SHALL BE GROUNDED IN ACCORDANCE WITH NEC ARTICLE 250.93 & 820.100.

PETER E. PAPAY

NEW JERSEY PROFESSIONAL ENGINEER NO. 32507

NJTRANSIT
The Way To Go.

1 PENN PLAZA EAST
NEWARK, NEW JERSEY 07105
OFFICE: (973) 491-7000

APPROVALS

PROJECT NO. 2744

DRAWN BY: P.A.

CHECKED BY: P.E.P.

SUBMITALS

DATE	DESCRIPTION	NO.
05/21/14	PRELIMINARY	0

SCALE:
AS SHOWN

OLD BRIDGE WATER TOWER
421 EAST GREYSTONE RD.
OLD BRIDGE, NJ 08857
MIDDLESEX COUNTY

SHEET TITLE
GENERAL NOTES

SHEET NUMBER
GN-1

COVER ASSEMBLES ONTO 10" INSIDE WIDTH
HEAVY TRAFFIC H-20 RATED CONCAST CHANNEL.

H-20 RATED - 32,000 LB. PER AXLE LOAD

NOTE: FOR NON-STANDARD LENGTHS THE PART NUMBER WILL CORRESPOND TO IT'S MEASURED LENGTH. IE: 8011HTSG 32"

CONCAST
1010 NORTH STAR DRIVE
P.O. BOX 69
ZUMBROTA, MN 55992-0069

DESCRIPTION: HEAVY TRAFFIC GALV. STEEL COVER

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL: ± 1/8"
ANGULAR: ± 2°

CONTACT INFORMATION:
EMAIL: INFO@CONCASTINC.COM
PHONE: (507) 732-4095
FAX: (507) 732-4094

SHEET 1 OF 1

PART NUMBER: 8011HTSG

DRAWN BY: ROBIN FLINT

DATE: 5/3/2013

REVISION LEVEL: 0

WEIGHT: 97 LBS.

MATERIAL: GALVANIZED STEEL

FIBERCRETE®
TRENCH
SYSTEM
1-7/8" X 1-7/8" GALV.
STEEL TOP RAIL (TYP)
STEEL REINFORCED CONCRETE
(4X)
48"
Ø 1/4" INSERT FOR
CABLE CLIP (2X)
23"
H-20 RATED - 32,000 LB. PER AXLE LOAD
016HTSG 32"
DESCRIPTION:
HEAVY TRAFFIC CHANNEL
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL: ± 1/8"
ANGULAR: ± 2°
CONTACT INFORMATION:
EMAIL: INFO@CONCASTINC.COM
PHONE: (507) 732-4095
FAX: (507) 732-4094
SHEET 1 OF 1
PART NUMBER:
801016HTSG
CONCAST
1010 NORTH STAR DRIVE
P.O. BOX 69
ZUMBROTA, MN 55992-0069

FIBERCRETE®
TRENCH
SYSTEM
1-7/8" X 1-7/8" GALV.
STEEL TOP RAIL (TYP)
STEEL REINFORCED CONCRETE
48"
Ø 1/4" INSERT FOR
CABLE CLIP (2X)
23"
(4X)
H-20 RATED - 32,000 LB. PER AXLE LOAD
016HTSG 32"
DESCRIPTION:
HEAVY TRAFFIC CHANNEL
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL: ± 1/8"
ANGULAR: ± 2°
CONTACT INFORMATION:
EMAIL: INFO@CONCASTINC.COM
PHONE: (507) 732-4095
FAX: (507) 732-4094
SHEET 1 OF 1
PART NUMBER:
801016HTSG
CONCAST
1010 NORTH STAR DRIVE
P.O. BOX 69
ZUMBROTA, MN 55992-0069

6. MICROWAVE BACKHAUL NETWORK REQUIREMENTS

6.1 Statement of Purpose

A. It is the intention of this specification to define the requirements for the digital microwave backhaul to link radios between OLD BRIDGE TOWNSHIP antenna sites. These microwave radios and associated antenna structures are to provide the OLD BRIDGE TOWNSHIP with carrier grade communications.

B. The proposed microwave system shall provide the means of interconnection between the three (3) 800 MHz RF sites of the Township's proposed P25 IP based Trunked Simulcast Radio System

C. PROPOSER shall ensure that the proposed microwave system shall sufficiently transport all voice and data circuits between the 800 MHz RF sites as necessary for the successful operation of the P25 IP based trunked simulcast system.

6.2 General Requirements

A. The digital microwave network shall support both IP and TDM communications, in addition to the digital P25 radio system. The microwave backhaul network is a crucial element of the communications system providing the transport backbone necessary to form a complete functional network.

B. The microwave system shall be designed as ring-protected digital microwave network, by adding (as necessary) one additional site in the link so as to deploy the ring-protected design and take advantage of the increased network reliability and availability resulting from a ring-protected design. Preliminary path analyses have shown that the following sites can be used to configure a reign-protected network, in accordance to the network diagram shown below:

1. Old Bridge Plaza
2. GSP Exit 120
3. Fire Station on Rt. 34
4. Old Bridge Water Tower

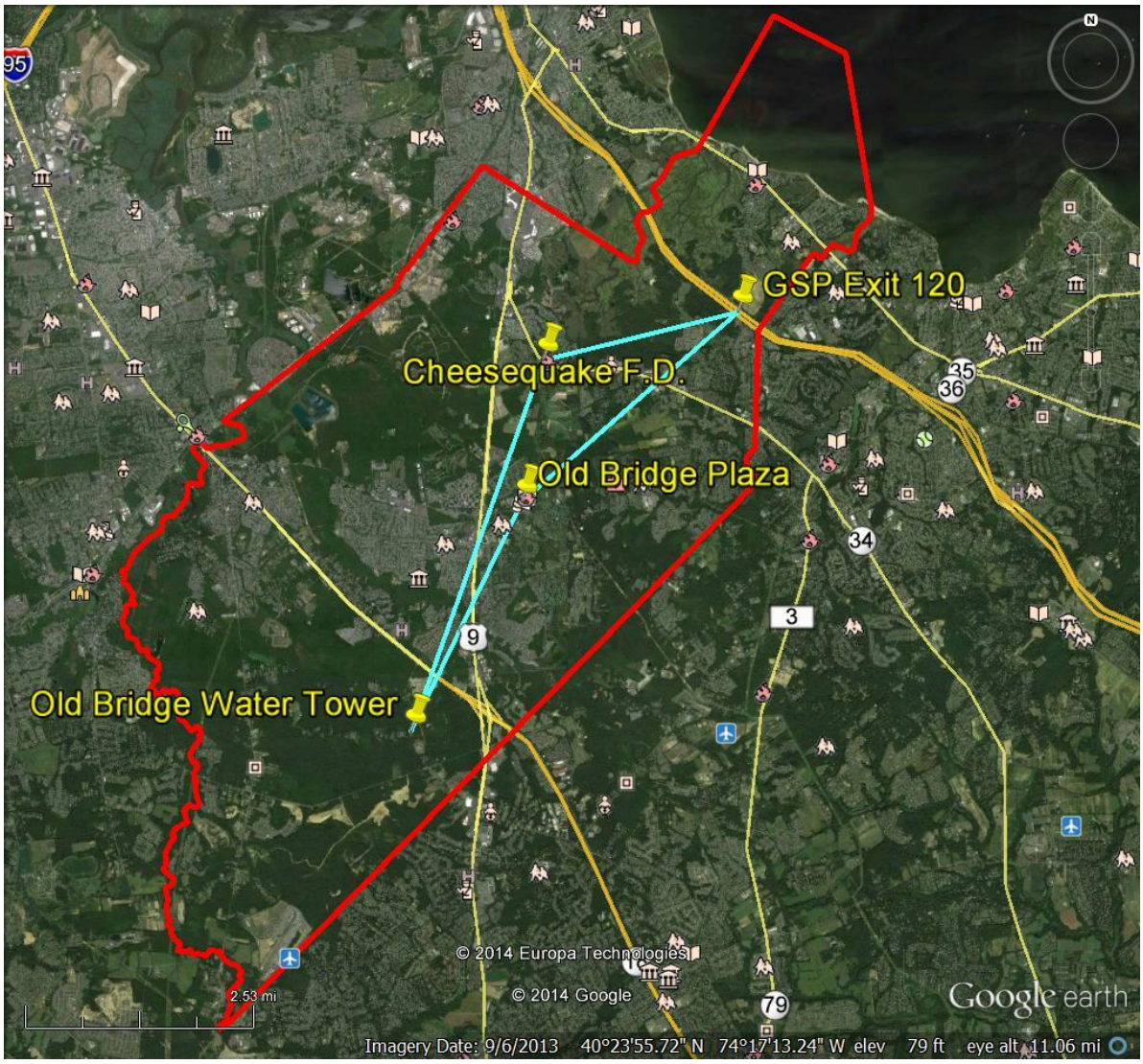

GSP Exit 120
Cheesequake F.D.
Old Bridge Plaza
Old Bridge Water Tower
© 2014 Europa Technologies
© 2014 Google
Google earth
Imagery Date: 9/6/2013 40°23'55.72" N 74°17'13.24" W elev 79 ft eye alt 11.06 mi

Figure 2 Conceptual loop microwave system

C. Included in the design shall be:

1. Properly sized parabolic microwave antennas, transmission lines, and mounting hardware
    a) waveguide pressurization and dehydration equipment as required
    b) Ring-protected transmitter and receiver with automatic loop switchover
    c) Multiplex and channel interface cards to support the radio system
    d) Interface equipment necessary to support transport of live surveillance video cameras
    e) Service channel to provide intercom between sites
    f) System to report alarms that fully integrated with the network management subsystem provided as part of the P25 Core architecture
    g) Power supply/charger and battery
    h) Racks and interconnecting cables

2. All equipment shall be mounted on 7', standard EIA 19" self-supporting racks. Each rack shall be provided with a copper ground bar, and a power distribution board equipped with fuses. A T1 jack for monitoring purposes shall also be provided.

D. All equipment shall be of the latest design, of modular construction, and easily accessible for maintenance and/or expansion.

E. The microwave network shall be capable of supporting sufficient bandwidth and power to provide future camera video to be transmitted to selected OLD BRIDGE sites on the network.

1. PROPOSER shall provide the OLD BRIDGE TOWNSHIP with link verifications based on “line of sight” projections taking into consideration the terrain, obstructions, vegetation and growth over a ten (10) year period, earth curvature, and Fresnel zone clearance.

F. PROPOSER must furnish all information as requested and complete all forms according to the section instructions. Any deviations or exceptions to OLD BRIDGE TOWNSHIP requirements should be noted on the first page of the proposal submission.

6.3 Technical Requirements

A. This section will define the elements required for the installation of the microwave backhaul network. These elements include the radios, antenna, transmission line and transmission line sub-assemblies, backup power, and grounding, and bonding.

B. The microwave system shall provide for automatic failover to an alternate channel in the event of a loss of communications on the primary channel.

C. Each link shall be configured for 99.999% availability and in a hot standby 2+0 configuration to ensure that a backup path is available should the primary radio fail. Responders shall describe how the proposed system fulfills this requirement.

D. The radio units shall be GPS-based with synchronization which shall be used to eliminate interference between sites in dense deployments.

E. To ensure maximum service availability the radios shall provide built-in ring protection functionality in case of equipment failure or link drop.

F. Microwave Network Engineering

1. Physical path surveys shall be conducted to assure that all proposed paths meeting proper clearance criteria.

2. The PROPOSER shall conduct site visits at all sites and notify the OLD BRIDGE TOWNSHIP of any site modifications necessary for the microwave link.

3. The PROPOSER shall provide antenna centerline mounting height recommendations, based on information gathered during the physical path surveys and site visits.

4. Minimum acceptable fade margin in any microwave link shall be greater than or equal to 40 dB.

G. **Reframe Time and Frame-Lossed Seconds:** A frame-lossed second shall be defined as a one second interval within which an out-of-frame condition exists or when the BER is 10^{-3}, or more. The average recovery time of the radio from an out-of-frame and out-of-synchronization condition to the reframed and resynchronized condition shall be 0.25 seconds or less. No more than 5% of the recovery time shall exceed 0.5 seconds. The maximum recovery time shall not exceed 2 seconds.

1. **Protection:** The radio equipment shall consist of a Ring-Protected, loop system. Each transmitter/receiver shall be equipped with its own power supply. The RF portion of the radio shall employ electronic switching for manual transmitter switching times of less than 20 milliseconds. Proposers shall state the maximum manual switching time of the transmit multiplexers. The maximum number of bit errors incurred during switching shall be provided for each case. The maximum time for automatic switching of transmitters shall be 10 milliseconds.
2. **Recovery** of the system from a prolonged (greater than 1 minute) RF signal loss shall take place within 5 seconds after a valid signal is restored. The mean restoration time of a valid DS1 output shall take place within 3 milliseconds after the removal of a short transient system disturbance, which interrupts only the radio system framing of the level-3 signals without loss of the basic line signals. This average time shall be determined over at least ten consecutive measurements.
3. Proposers shall provide a detailed summary and theory of operation of the loop switching schemes. All information supplied by Proposers regarding the available protection systems shall be reviewed and considered in the evaluation process.
4. Electromagnetic Interference: Shielding and filtering shall be provided to prevent interference from, or to, other radio frequency equipment installed near or in the vicinity of the proposed equipment. The equipment shall meet or exceed spurious frequency emissions, conducted or radiated, as outlined in Part 15 of the FCC Rules and Regulations, Subpart J, Class B Computing Devices. Equipment shall be operationally compatible with the following types of equipment located adjacent to the microwave radio:
    a) VHF Base/Mobile Stations
    b) UHF Base/Mobile Stations
    c) 700/800 Base/Mobile Stations
    d). VHF/UHF/700_800 Hand-held Radios

H. Carrier Class Broadcast Outdoor Station Radio Transponder for outdoor mounting.
    1. The unit shall be suitable for mounting on antenna tower structures, water tanks or buildings.
    2. The unit shall be comprised of either a self-contained integral antenna or a separate antenna meeting these specifications.
    3. The unit shall comply with the following environmental requirements.
        a) Operating Temperatures: 0°C to 55°C Humidity 95% condensing at 55°C; IP67 (totally protected against dust and immersion up to 1m)
        b) Shock and Vibration: EN 300 019-2-4 IEC 60068-2 Class4M5

I. Radio transmission must comply with FCC-47CFR Part 90

J. Frequency Band: 11 GHz FCC Licensed Radio

K. Transmitter
    1. Frequency Stability: Each transmitter shall maintain frequency stability within plus or minus 0.001% from 0° to +50° Celsius.
    2. Power Output: The microwave radio shall provide sufficient power to meet the required path reliability.

3. Reverse Path Protection: If the BER of both receivers exceeds 10-5, the radio shall send a control signal through the reverse path to cause the far end to switch to reverse the loop.

L. Radio Receiver

1. Noise Figure: Receiver Noise Figure at the LNC input shall meet, or exceed 2 dB.
2. Unfaded BER: Unfaded BER shall not exceed 10^{-11}.
3. Sensitivity: Receiver threshold at the antenna port must be specified in the proposal for BER levels of 10-3 and 10-6.
4. Switching: Loop and Space Diversity (if applicable) receiver switching shall be hitless and errorless.

M. Alarm & Control – Local/Remote

1. Display/Keypad: Each radio assembly shall be equipped with an integral alphanumeric display/keypad to provide both local and remote equipment status and control of each site in the system independently of any alarm reporting system.
2. Panel Display: The microwave radio shall be supplied with a front panel mounted meter for use by maintenance personnel. The proposal shall detail the display metering functions in the proposal.
3. Failures: Each multiplex and modem plug-in unit shall be equipped with a red LED to indicate when that unit should be replaced.
4. Alarm and Controls: The radio assembly shall be equipped with an RS-232C port to extend the Control and Alarm system to a network management software system resident on a personal computer. The proposer shall describe the alarms and controls available as part of the proposal.

N. Drop & Insert Capability

The microwave system provided must include the capability to drop and insert at the DS-1 level at each radio site for each direction of transmission.

O. Built-In Test Equipment

1. Loopback**:** Each radio assembly shall perform the following functions as a minimum:
    a) VF loopback, using the drop and insert multiplexer.
    b) Local IF loopback, both before and after the Adaptive Slope Equalizer.
2. Differential Absolute Delay Equalizer (DADE): An adjustment shall be available to equalize different waveguide lengths for Space Diversity antennas (if applicable).
3. Test Points: Test points shall be available for measuring AGC and an analog voltage proportional to BER, at various microwave system capacity levels.
4. Service Channel

    The service channel shall be digital and provide for a minimum of two voice talking circuits and two RS-232C data circuits. The service channel shall be implemented without external interface equipment.

P. Antenna System

1. Parabolic dish antennas meeting FCC Antenna Category A shall be selected by the Contractor in accordance with the system operating margin characterized by the system design. All mounting hardware (galvanized steel) shall be furnished and installed.
2. All dishes shall be low VSWR antennas.
3. Each antenna shall be protected with a radome.
4. Antennas with a 4 foot dish size or larger shall be equipped with a side strut.
5. Antennas shall be connected to the equipment with pressurized waveguide.

Q. Automatic Dehydrators, low-pressure sensors, distribution manifolds and desiccants shall be furnished and installed in accordance with the cable manufacturer's installation specifications. Low-pressure and High-pressure sensors shall be interfaced with the trunked radio system's alarm system. In addition, excessive run and high humidity shall be alarmed.

6.4 Installation

A. General

1. RF backhaul units shall be mounted no more than 100 feet from the 700/800 MHz radio equipment.
2. All cables, both coaxial and Ethernet shall be suitable for outdoor use and shall have ultraviolet protected sheaths.
3. All equipment shall be factory tested and certified prior to installation.
4. PROPOSER shall provide copies of these certifications along with all instruction manuals and warranties.

B. Wiring

1. Wiring shall be installed between devices as specified by the manufacturer for low-voltage connections for network and data line circuits.
2. Wiring method shall be in raceway or conduit for maximum protection.
3. Wiring shall be bundled and supported in enclosures.

C. Identification

1. All components, power wiring and control wiring shall be identified.

D. On-site Assistance

1. Within one year of date of Substantial Completion, provide up to three project site visits, when requested by OLD BRIDGE TOWNSHIP to adjust components and to assist TOWNSHIP personnel in making adjustments that may be necessary based on actual conditions.

7. SYSTEM IMPLEMENTATION, TEST AND ACCEPTANCE REQUIREMENTS

7.1 Installation Planning

A. Following contract execution, the PROPOSER'S Project Manager shall, within twenty (20) days, submit the following project documents for mutual review and approval and project baseline.

B. Final Detail System Design Document – this document shall include all elements of the original proposal with all modifications as agreed to be included as per the contract, plus the following:

1. Detailed project plan in CPM/PERT chart format which clearly shows all responsible persons, task start, task duration, and task completion dates. The project plan will also clearly delineate all implementation roles and responsibilities of Old Bridge Township and the Township's engineer. No task or activity in the CPM/PERT shall have a duration longer than twenty days.
2. Detailed functional system block diagram.
3. Detailed site diagrams for every site in which equipment will be installed including floor plans, rack layout diagrams, and detailed interconnection diagrams.
4. Detailed equipment list, categorized by site.
5. Statement of Work to be performed for complete turnkey installation, testing, training, and commissioning.
6. Detailed System Transition/Cutover Plan
7. System Staging Test Plans
8. Equipment shipping, delivery, and inventory plans.
9. Detailed Equipment Installation plans and responsible persons.
10. System Functional and Performance Acceptance Test Plans
11. Coverage Acceptance Test Plan
12. Training Plans for End Users, Technicians, and System Manager
13. System Burn-in and Reliability Test Plan
14. A Project Management Plan with description of the project management approach or strategy.
15. A Risk Management plan which identifies key risks, including constraints and assumptions, and planned responses for each.
16. A Change Control Plan which describes the change control process.
17. Project communications plan or strategy, including periodic reporting requirements and milestone achievement determination.
18. Issues Documentation and Action Item Log which provides, on a weekly basis, a written list of open issues and pending decisions.

7.2 System Staging

A. Factory Staging

1. The PROPOSER shall stage and test all fixed equipment at the factory location. All system components shall be made operational and shall be factory tested prior to installation in the field. The Township shall supply representatives to witness the

factory staging and testing of the equipment. All equipment must be functional within the staged system prior to delivery acceptance. Microwave RF equipment may be staged separately from the trunked simulcast system; however, network IP and other interface equipment required for proper simulcast operation must be demonstrated with the trunked system at the factory.

B. Staging Prerequisites

1. The PROPOSER shall develop a functional test plan for the review and approval by the Township and schedule this visit at the appropriate time prior to field delivery. System drawings, cabling diagrams, and interconnect diagrams shall be prepared and available for viewing at the time of the test.

2. Proposers shall include in their proposals a sample-staging document, defining the staging tests that will be performed for the Township's review. This document will be considered for use in the development of the final factory acceptance test document which will cover sub-system interfaces, Proposer responsibilities, and Township responsibilities, staging requirements and testing, test procedures and documentation required for field release.

C. Staging Participation

1. The Staging Area/Testing Site shall permit the Owner's representatives to become familiar with the system and test the system features. The PROPOSER must prepare and provide costs for two (2) full days of staging attendance to provide for factory acceptance testing as well as training. Customer travel to the Vendors staging facility must be included for two (2) representatives from the Township and one (1) representative from the Township's Engineer or their designee.

D. Pre-Assembly before Shipping

1. As much of the site equipment of the System as practical shall be assembled as complete sites for direct shipment to the site locations in the field. All cabling, wiring, programming and equipment configurations shall be completely integrated in their final configuration prior to shipment. Upon arrival at their final destination, the hookup of racks, external power, grounding and antennas to the site equipment should complete the physical integration of the sites and allow them to be "on-air" ready. No additional work should be needed to ready the site for operation. It is understood that additional optimization (level setting, power adjustment, etc.) may be required to meet the technical requirements of this specification.

7.3 Radio System Installation

A. Grounding

1. All equipment that can be electrically grounded without impairing performance shall be grounded. This shall include all metal conduit trays, racks, chassis, shelves, antennas, and transmission lines in accordance with this RFP.

2. The primary grounding system at each site is the responsibility of the Township and presumed to be in good order. The PROPOSER shall inspect and test the grounding system at all sites. If deficiencies are noted, the PROPOSER shall provide a written report delineating the deficiencies on a site-by-site basis. The Township will be responsible for disposing of the deficiencies.

The PROPOSER shall furnish and install any additional required grounding and bonding conductors and make connections to Township furnished grounding system, including the communications centers. The conductors shall be No. 2 AWG solid copper wire or larger. Bonding conductors shall be used to bond the various pieces of equipment, conduit, trays, etc. together.

3. Ground conductors shall be run as straight as possible with a minimum number of bends.
4. Bends shall have a minimum radius of 12 inches.
5. All electronic equipment shall be connected to the power and control line surge protection devices specified in this document.

B. Common Equipment Wiring Termination Panel (CEWT)

1. The PROPOSER shall supply and mount a CEWT for interconnection of all audio, control, microwave, and telephone circuits. The CEWT shall consist of a plywood backboard mounted in each equipment room at each site, space permitting. Otherwise, the CEWT may be rack-mounted or frame mounted but cable lengths must be adequate to permit wall mounting in the future, should space become available. Industry Type 110 connecting blocks, or equivalent, shall be mounted on the board, rack, or frame to facilitate interconnection of equipment. All connecting blocks shall be appropriately labeled for each circuit connected.

C. Repeater Stations

1. The repeater stations and any satellite receiver units shall be placed to provide reasonable access for servicing and maintenance, to ensure proper cooling and to facilitate installation and servicing requirements.

D. Antennas (Repeater)

1. Throughout the system the transmitters shall use transmitting antennas and the receivers shall use receiving antennas. The receivers shall be connected to the receiving antenna via a receiver multi-coupler. The transmitters shall be combined and connected to the transmit antennas via transmitter combiners. The antenna mounting heights and locations for each repeater station are to meet FCC and/or NPSPAC restrictions.

E. RF Transmission Lines

1. The 800 MHz repeater transmit/receive transmission lines shall be securely fastened to buildings and towers using the hanger clamp devices. Particular care shall be exercised to prevent any physical damage or deformation of the line. Terminating connectors and hanger clamps shall be approved by the cable manufacturer and installed per cable manufacturers' instructions and properly torqued. The best commercially available parts shall be used. Hoisting grips shall be left in place to better secure the cable.
2. Transmission line grounding straps shall be installed at the top and bottom of each transmission line and at the entrance of each equipment building. Grounding conductors shall be properly installed. The grounding conductor shall be routed by the most direct path to the nearest grounding system conductor. Transmission lines are inherently grounded to the bulkhead entrance panel via the surge protection devices.
3. After ground strap installation and to preclude corrosion, the work shall be wrapped with overlapping layers of black outdoor electrical tape and protected with outdoor treatment approved by the Township.

F. RF Cable and Connectors

1. Type N, Type LC, Type 7/16-inch DIN or other acceptable connectors with Teflon insulation and gold or silver-plated mating surfaces are required throughout for the 800 MHz applications (exceptions may be permitted for using mini-UHF or TNC connectors on the mobile radios and special connectors on the portables). The

mating surfaces shall remain tightly wrapped and protected until mating; touching with the fingers shall be avoided. Silicone or other material shall not be used in the connectors.

2. Connectors shall be torqued to the manufacturer's specifications with a proper torque wrench; hand tightening is not acceptable. After proper torqueing, outdoor connections shall be shrink tube protected to preclude corrosion. Shrink tube size shall be in accordance with the manufacturer's recommendations for the size of line and type of connector.

G. Transmitter Combiners, Duplexers, and Filters

1. The transmitter combiner components shall be mounted in an "open" floor mounted rack. The rack shall be securely fastened. All RF connectors shall be properly torqued; hand tightening is not acceptable.

H. Receive Multi-couplers

1. The receiver multi-coupler shall be installed within the equipment room within a separate or shared rack. The multi-coupler unit shall not be placed in a transmitter cabinet or in the transmitter combiner rack.

2. All RF connectors shall be properly torqued. Hand tightening is not acceptable. All joints and fasteners shall be securely tightened and properly torqued to preclude RF noise generation.

I. Mobile Radios

1. The mobile radios shall be installed by the PROPOSER at the Township's facilities (if available) or at the PROPOSER's facilities, whichever is the closest to the normally assigned location of the vehicle and/or whichever the Township deems to be in its best interest.

2. The PROPOSER will provide the Township with an estimation of the time needed to perform each installation. The PROPOSER and Township will agree upon an installation schedule, and the Township will make vehicles available at the installation location as required.

3. Existing agency mobile radio equipment shall remain operational in every vehicle until the 800 MHz system is complete and operational Township wide. Alternatively, existing conventional systems of communications may be "hard-patched" to dedicated talk-groups on the 800 MHz system to satisfy the requirement for continuous service.

4. All mobile installations and removals shall be performed in such a way and to a time schedule that shall minimize down time and out of service time of the operational units. The PROPOSER shall coordinate all mobile radio installations and removals with the Township's Project Manager.

5. The mounting locations of the mobile radio equipment shall be solely at the discretion of the Township and may vary from vehicle to vehicle dependent upon operational requirements. The mobile antennas shall be installed in the same location as any existing antennas, where practical. Should the antenna require a new location on the vehicle, the old antenna hole shall be plugged with an appropriate rubber plug. All cabling, connectors, brackets, and hardware shall be provided and installed by the PROPOSER.

6. Each trunk mount mobile radio shall be installed in the trunk or other location designated by the Township with the control unit, speaker, and microphone installed in the vehicle console provided or as specifically designated by the Township Representative prior to installation. The control unit and microphone shall be

accessible from the driver's position or as otherwise specified by the Township/ Interconnecting cabling shall be properly designed and constructed (shielding, twisting, placement) so as to preclude adverse effects from electrical interference that may be present within the operating area of the vehicle. Ribbon cable is not acceptable external to the various equipment pieces.

7. Mobile radio equipment and radio accessories are to be mounted in a manner that will permit safe operation of the vehicle and will not interfere with proper operation of safety equipment or air-bag system.

8. All installations shall be performed per the manufacturer's recommendations and shall use good engineering practice (wires and cables bundled, no sharp edges exposed, no wire exposed, wires insulated from catalytic converter and engine heat, etc.).

J. Mobile Radio Antennas

1. The mounting locations of the mobile radio antennas shall be solely at the discretion of the Township and may vary from vehicle to vehicle. The PROPOSER shall recommend with the response the best mounting and type of antenna to use, considering uniform pattern and best over-all performance.

2. A sample installation shall be performed by the PROPOSER for each type of vehicle/mobile antenna configuration, for the Township's acceptance, prior to continuing and completing the respective fleet installation.

3. Each antenna shall be installed per the manufacturer's instructions and shall be checked/adjusted for a measured VSWR of 1.5:1 or less. The RF coaxial connections shall be properly installed and properly tightened.

K. Portable Radio Equipment

1. Portable radios, single unit chargers, multi-chargers, spare batteries, and associated accessories shall be factory tested and delivered to a location designated by the Township.

7.4 Microwave System Installation

A. General

1. The microwave system installation shall include all of the equipment formally specified for the new digital microwave system and all other hardware, appliances, and procedures required for a complete operating system. The microwave installation requirements shall be in addition to the other applicable requirements stated herein.

B. Equipment Installation

1. The microwave radio equipment shall be installed in accordance with the technical parameters of the Township's FCC license authorizations and all applicable requirements of Part 101 of FCC Rules and Regulations.

2. The PROPOSER shall furnish and install the necessary wiring, cabling, and conduits necessary for connection of the microwave station equipment to AC and DC power and ground. Equipment racks shall be firmly bolted in place.

3. Antennas shall be mechanically and electrically bore-sighted. All microwave transmission lines shall be "finish-cut" to length. All pressurized transmission lines routed to indoor mounted pressurization and radio equipment shall have a downward slope from the antenna support structure to the radio equipment building (no drip loop).

4. Pressurization systems shall be installed to all elliptical waveguides provided by the PROPOSER. Unused pressurization ports shall be properly terminated.
5. As necessary, the PROPOSER shall install, route and terminate DSX, VF, data, and alarm cables to the demarcation blocks within the equipment building.
6. The PROPOSER shall align and optimize all electronic equipment.

C. Installation Coordination

1. The PROPOSER shall carefully coordinate all phases of the work with the Township to minimize equipment downtime. The coordination efforts shall be between the PROPOSER, subcontractors, the Township, existing equipment maintenance shop, and the telephone company. Conflict resolution shall be at the sole discretion of the Township.

D. Site Restoration

1. At the completion of the installations specified herein, the PROPOSER must remove all debris that are a result of such installations, and return the work areas to original conditions. Special consideration must be given to the public safety communications center during equipment relocation and installation to minimize the disruption of "ongoing" dispatch operations. PROPOSERs may provide, as an option, the overall project cost reduction if the Township is responsible for debris and refuse removal and disposal.
2. Damage to any equipment, floor tiles, roof tops, exposed surfaces, or other building facilities in any way shall be repaired or replaced by the PROPOSER at the PROPOSER's expense; repair or replacement shall be at the sole discretion of the Township.

E. Other Existing Equipment

1. Existing equipment shall be removed from service and disposed following review of inventory of equipment to be removed and approved. The Township will approve removal of any existing equipment prior to the work.

F. Existing Equipment Integration

1. The PROPOSER shall be responsible for integrating all Township-supplied equipment, including legacy radio infrastructure equipment, logging recording equipment, etc., to provide a completely functional communications system (as required)

G. Logging Recorder System Integration

1. The PROPOSER shall supply any necessary interface devices to connect the trunking equipment, conventional equipment, and telephone equipment to the new logging recorder equipment referenced previously in this RFP.

H. General

1. The PROPOSER shall verify system performance to the Township prior to beginning the Performance Period. System performance shall be demonstrated by equipment/system tests and verifications.
2. The PROPOSER shall provide all necessary technical personnel and test equipment to conduct the tests. The PROPOSER shall coordinate with the Township in regard to scheduling of the tests and provide at least a three week notice prior to performing the tests.
3. It is recognized that a variety of testing procedures and equipment may be utilized to verify a particular specification. Therefore, the PROPOSER shall be

afforded latitude in this regard provided the methods proposed are regarded as acceptable in the industry, as determined by the Township and the Township's Engineer. All test results shall be recorded in a standardized format to be determined by the PROPOSER. The format to be used for recording of test program data shall be submitted to the Township for approval 30 days prior to testing. All recorded test program data shall be dated, witnessed, and signed by the Project Manager and designated representatives of the Township and the PROPOSER. The entire test data shall be presented in a single test report.

I. System Acceptance Test Plan

1. A System Acceptance Test Plan (SATP) shall be submitted with the response. This plan shall form the basis for a mutually agreed upon SATP between the Township and the PROPOSER. The SATP shall, as closely as possible, resemble the "real life" application of the equipment and shall include, but not be limited to:
    a) Technical compliance:
        1) Fixed end equipment
        2) Field equipment
    b) Operational compliance:
        1) Dispatch Consoles
        2) Subscriber units
    c) RF coverage compliance:
        1) 800 MHz system coverage
2. In addition to the PROPOSER-provided equipment, all existing Township equipment to be modified and/or relocated shall be tested or demonstrated to be fully functional both before and after modification and/or relocation.

J. 800 MHz Radio Systems Equipment/System Tests

1. Following equipment installation, the following minimum tests shall be performed for each piece of equipment (including any modified and/or relocated existing equipment). Any equipment not meeting the requirements of this RFP shall be repaired or replaced by the PROPOSER without additional cost to the Township. These tests shall be:
    a) Base stations:
        i. Transmit frequency.
        ii. Transmitter deviation/transmit bandwidth (normal speech).
        iii. Forward and reflected power at transmitter output.
        iv. Forward and reflected power at combiner output.
        v. Insertion loss of combiner.
        vi. Receiver frequency.
        vii. Receiver threshold sensitivity.
        viii. Receiver multi-coupler gain/loss.
    b) Voting comparator (if required):
        i. Operational tests to be conducted to verify end-to-end proper functioning of each channel of each comparator.

c) Antenna and transmission line tests:

i. All antennas and transmission lines shall be tested from the interior of the equipment buildings using Time Domain Reflectometry (TDR) and a TDR unit capable of producing a hard copy of the results. This method of measurement shall indicate any impedance discontinuities in the transmission line/antenna system. Additionally, the VSWR shall be determined at the input connector of the transmission line. The PROPOSER shall provide suitable documentation of the test results. At a minimum, the TDR (photograph, thermal printout, or graphic drawing) test data shall be provided.

d) Mobile radios:

i. Transmit frequencies.

ii. Transmitter deviation/transmit bandwidth (normal speech).

iii. Forward and reflected power at transmitter output.

iv. Receiver frequencies.

v. Receiver threshold sensitivity.

e) Portable radios:

i. Transmit frequencies.

ii. Transmitter deviation/transmit bandwidth (normal speech).

iii. Receiver frequencies.

iv. Receiver threshold sensitivity.

f) Coverage testing (see next section)

K. RF Coverage Acceptance Criteria

1. This section defines RF coverage acceptance criteria for the 800 MHz simulcast system.

L. 800 MHz RF Coverage Acceptance Criteria

1. The Township's acceptance of the RF coverage portion of the system shall be based on successful passage of the RF Coverage Acceptance Test.

2. A detailed RF Coverage Acceptance Test Plan (RFC-ATP) shall be included in the PROPOSER's response. The RFC-ATP shall reflect the system proposed and include, at a minimum, the following items:

a) A brief description of how the testing shall be conducted.

b) Township manpower requirements.

c) A list of testing instrumentation to be supplied by the PROPOSER for the actual data gathering.

d) How long the test shall take (approximate time).

e) An explanation of the methodology of data gathering.

f) An explanation of how the results shall be tabulated and documented.

g) An explanation of why the methodology of data gathering and presentation of the results to the Township shall "prove" that the coverage reliability requirement of this document shall be met, and shall certify that testing process closely correlates to the actual coverage reliability.

3. The RF coverage performance tests shall be performed in all geographic areas of the Old Bridge Township hereinafter referred to as the service area.
4. Consistent with TSB-88 requirements for coverage testing of simulcast RF systems, talk out testing shall be performed utilizing Bit Error Rate (BER) testing and both talk out and talk back testing shall be performed utilizing Digital Audio Quality (DAQ) testing.
5. Testing shall not commence until the PROPOSER has installed and activated all infrastructure equipment provided in response to this RFP, and testing shall occur while the system is operating in digital trunked simulcast mode.
6. Data for the BER and DAQ tests may be collected simultaneously, but must be analyzed and evaluated independently. Rain shall not delay the scheduled testing.
7. In addition, the identified critical infrastructure locations where radio coverage must be guaranteed shall also be tested.
8. System acceptance will occur after successful completion of the BER, DAQ and critical infrastructure coverage tests. The required BER, DAQ and critical infrastructure testing procedures are detailed in the next three sections.

M. Bit Error Rate (BER) Testing

1. The PROPOSER shall perform an automated BER test to evaluate system talk out. The test evaluation team shall consist of a minimum of one Township representative and one PROPOSER representative, who must be present and verify the testing process.
2. In order to perform this test the service area shall be divided into uniformly sized grid squares, consistent with TIA/EIA/TSB88-C, in order to yield a 95 percent or higher confidence level. The maximum allowable grid size shall be 0.25 miles on any side. An automated BER test shall be performed in each grid where a portion of that grid is within the service area boundary. Testing points within each grid shall be randomly chosen. All randomly chosen test points must be within the service area.
3. This automated coverage test shall incorporate critical time constants for 800 MHz RF coverage testing. A method of correlating the location and the BER measurement, such as a GPS receiver, shall be employed to assist with the subsequent coverage performance analysis. The testing instrumentation shall be configured to allow use both on foot and in a vehicle, and shall simulate a portable radio, worn at hip level, assuming a 12 dB building penetration loss for all grids covering any portion of the Township. The testing instrumentation shall be verified by an independent means acceptable to the Township both before and immediately following the test. Test equipment shall remain in the possession of the Township for the duration of the test.
4. A test route shall be developed by the PROPOSER and approved by the Township. Required data shall be recorded at each grid throughout the test route. Transportation shall be provided by the Township to any test locations not generally accessible by car.
5. Successful completion of the BER test shall occur when 95 percent or more of the total grids yield a BER of 2% or less.

N. Digital Audio Quality (DAQ) Testing

1. The PROPOSER shall perform a DAQ test to evaluate system talk out and talk-back. The test evaluation team must consist of a minimum of two Township representatives and one PROPOSER representative, who must be present to conduct this test.

2. In order to perform this test the service area shall be divided into uniformly sized grid squares with sides as determined in TIA/EIA/TSB88-C to yield a 95 percent or higher confidence level. The maximum allowable grid size shall be 0.25 miles on any side. A DAQ test shall be performed in each grid where a portion of that grid is within the service area. A test point within each grid will be selected by the Township, with the understanding that selected points shall not cluster adjacent grid test points together. All selected test points must be within the service area.
3. The testing instrumentation shall be configured to allow use both on foot and in a vehicle, and shall simulate a portable radio, worn at hip level for all grids covering any portion of the Township of Old Bridge. The testing instrumentation shall be verified by an independent means acceptable to the Township both before and immediately following the test. Test equipment shall remain in the possession of the Township for the duration of the test.
4. Each test point may be evaluated on street utilizing the configured test instrumentation, or in an actual building using a standard portable radio, at the Township's discretion. Each test point may be evaluated from a fixed location or in a moving environment, at the Township's discretion.
5. The Township will provide test messages representing commonly used dispatch language for the Fire and Police Departments. The PROPOSER and the Township must mutually agree on the test messages. The test messages will be no longer than 10 seconds in length. Test messages will be drawn at random, read and evaluated.
6. If a majority of the evaluation team believes that the test message met a minimum DAQ of 3.4 on the first transmission, the grid passes.
7. If a test point is evaluated on-street utilizing the configured test instrumentation, and a majority of the evaluation team believes that test message did not meet a minimum DAQ of 3.4 on the first transmission, the grid fails.
8. If a test point is evaluated in-building utilizing a portable radio, and a majority of the evaluation team believes that the test message did not meet a minimum DAQ of 3.4, a building penetration loss level must be determined.
9. The definition of DAQ 3.4 is listed in the table below.

DAQ	Subjective Performance Description
1	Unusable. Speech present but unreadable
2	Understandable with considerable effort. Frequent repetition due to Noise/Distortion
3	Speech understandable with slight effort. Occasional repetition required due to Noise/Distortion.
3.4	Speech understandable with repetition only rarely required. Some Noise/Distortion.
4	Speech easily understood. Occasional Noise/Distortion
4.5	Speech easily understood. Infrequent Noise/Distortion
5	Speech easily understood.

10. The definition of rarely as it applies to the definition of 3.4 DAQ will be based upon the determination of the test evaluation team. The test evaluation team shall be provided with the definition of 3.4 DAQ and audio tape examples of 3.4 DAQ. In the final analysis it shall be up to the test evaluation team to determine if the 3.4 DAQ has been achieved.
11. Successful completion of the DAQ test shall occur when 95 percent or more of the total grids achieve a minimum DAQ of 3.4 or better for both talk out and talk back.

12. However, the DAQ test shall be considered failed if any four (4) adjacent or contiguous grids, in any horizontal, vertical or diagonal combination, fail to achieve a minimum DAQ of 3.4.

O. BDA/DAS System Performance Testing

1. The in-building locations identified in this RFP must be specifically tested to ensure adequate in-building radio coverage.
2. The PROPOSER shall perform a DAQ test to evaluate system talk out and talk-back at the Old Bridge High School and Middle School Campus. The test evaluation team must consist of two Township representatives and one PROPOSER representative, who must be present during each location test.
3. Consistent with TSB-88 guidelines, the evaluation team shall determine a statistically significant number of test points based on the size of the specific location to be tested. Test points will be chosen by the Township, and shall include in-building locations
4. Testing shall occur using a portable at hip level, following the procedures and definitions for DAQ testing as detailed in the previous section. Each building on the campus shall be independently tested.
5. Successful testing of each building shall occur when at least 95 percent of the in-building test points at that location achieve a minimum DAQ of 3.4.
6. Successful completion of in-building coverage testing shall occur when each building is tested successfully.

P. Coverage Performance

1. The PROPOSER shall guarantee RF coverage performance in accordance with the requirements in this RFP. If the RF coverage performance of the system supplied by the PROPOSER does not meet the RFP requirements, the PROPOSER shall modify or otherwise cause the system to meet the requirements of this document at no cost, either direct or indirect to the Township.
2. The PROPOSER shall submit a plan to meet such requirements that is satisfactory to the Township, at the Township's sole discretion.
3. This plan shall become an enforceable part of the written contractual agreement between the Township and the PROPOSER.

7.5 Microwave Network

A. Microwave Equipment Tests

1. Subsequent to microwave equipment installation, the following minimum tests shall be performed for all PROPOSER-furnished equipment to verify function and operation. Any equipment not meeting the requirements of this RFP shall be repaired or replaced by the PROPOSER without additional cost to the Township.

B. Microwave radio

1. Visual mechanical inspection.
2. Compliance with FCC Rules and Regulations including:
    a) Transmitter power output
    b) Transmitter frequency
    c) RF bandwidth

3. Receiver threshold sensitivity for 10-6 BER.
4. Switches and indicators.
5. Meter readings.
6. Simulated local failures to demonstrate main-hot-standby and loop switching.
7. Antenna system VSWR/return loss across the frequency band of operation.
8. Alarm outputs and remote control functions.
9. Verify levels.

C. Microwave Network Monitoring and Control System:

1. RTU alarm monitoring points shall be tested using local display.
2. Verify reporting of alarm remote terminals to workstation terminals. Verify performance of controls to remote terminals.
3. Master terminal station shall be verified for proper programming, redundant switching, reporting, and report generation.
4. Workstation terminals shall be demonstrated for proper operation and presentation of graphics and text displays.

D. Battery power supplies:

1. Verify system float and equalize voltages.
2. Measure and record cell/battery voltages.
3. Battery charger alarms and indications.
4. Battery charger load sharing/standby switching.

E. Microwave Radio Tests

1. Net path loss shall be measured and recorded for each RF path.
2. Received carrier power for each end of each path.
3. Calculation of flat fade margin.
4. Verify voice service channel operation including:
    a) DTMF selective call and all-call.
    b) Talk-test each site.
    c) Data service channel.

F. Generator

1. Automatic controls which signal the engine-generator to start upon signal from normal source sensors shall be tested
2. Time delay start, variable from 0 to 5 seconds, shall be tested to ensure avoidance of nuisance start-ups.
3. Test of the transfer switch which shall transfer when the emergency source reaches the set point voltage and frequency.
4. Test the switch which shall retransfer the load to commercial power after a time delay retransfers.

5. Test the control that shall automatically signal the engine generator to stop after a time delay, which shall be adjustable from 0 to 10 minutes, the time starting on return to commercial power.

G. UPS

1. Normal operation.
2. Simulated power outage to switch to generator.
3. Battery only operation.
4. Return to normal operation from conditions B and C.
5. Maintenance bypass.

H. Installation Drawings and Maintenance Manuals

1. The PROPOSER shall furnish three sets of "as built" drawings and maintenance manuals for each site where work is performed, within 30 days after completion of installation. Two copies shall be provided to the Township. Each piece of electrical equipment installed in the building shall be provided with a maintenance manual that depicts circuit diagrams, as well as proper unit assembly and installation. All drawings and maintenance manuals shall include all modifications and revisions made to the original drawings, and completely reflect the final layout and configuration of all towers, foundations, power systems, equipment, and alarm points on the PROPOSER provided Type 66 punch block.

7.6 System Acceptance and Performance Period

A. The system shall be accepted by the Township upon completion of a successful performance period for each phase of the project as described below:

1. The equipment shall be individually tested and a performance verification test report shall be completed for each major equipment category. This shall be accomplished during a period of time not to exceed forty-five (45) consecutive calendar days after equipment delivery, installation and optimization. Any delays beyond this time period shall be submitted in writing, and further disposition shall be affected by the factors involved in the delay.
2. The performance verification shall be accomplished with the Township's point of contact or his designee present and participating in the testing for compliance. The Township shall make available test compliance persons within seven (7) calendar days of notification by the PROPOSER.
3. System performance shall be tested when all fixed equipment is completely constructed and 75% of all mobile and portable devices are delivered and installed. Performance verification of field unit equipment may be accomplished by a random three (3) percent sampling provided all field unit equipment is factory tested and documented to the Township.

B. A performance period of thirty (30) consecutive calendar days of successful operation after installation and performance verification shall constitute a successful performance period.

1. During the thirty (30) day performance period, the Township shall utilize the communications system for its intended purpose (in-service use) to test all operational modes and equipment configurations with the system fully loaded to peak activity to ensure that all operational modes function properly and that all system "bugs" have been corrected. The use of the system during this performance test period shall not be interpreted as being "accepted" by the Township.

C. The remaining 25 percent of field unit equipment shall be delivered, installed (as necessary), performance verified and accepted on or before 60 consecutive calendar days after equipment installations and optimization.

1. Successful operation is defined as the absence of any major failure of equipment or equipment function. Minor failures, such as operational problems and adjustments normally encountered during implementation of a new system, shall not constitute a failure in achieving successful operation.

2. The following is a listing of items that define a major failure:

    a) Malfunctions that cause:

        i) System Controller (or server) and associated IP equipment failure.

        ii) Mobiles receiving a denial or busy tone.

        iii) More than one wire line console operator position off the air.

        iv) Two or more channel resources down.

        v) A simulcast failure affecting one or more sites or two or more channels.

        vi) Loss or failure of system configuration database.

        vii) Loss or failure of subscriber database.

    b) The wire line console dispatch equipment is integral to each respective trunking subsystem. A failure of the wire line console dispatch equipment will constitute a major failure to the affected trunking subsystem(s).

    c) The trunking controllers are integral public-safety operations. Any failure of this equipment that affects operations or prevents communications on the trunking system will constitute a major failure.

3. The following is a listing of items that define a minor failure:

    a) Failure of no greater than one repeater channel, provided that such failures are corrected within the maintenance response time required by the RFP.

    b) Failure of any equipment that does not cause the interruption of trunking operation or wired trunked console dispatch functionality, provided that redundant equipment automatically switches into operation in accordance with the RFP.

    c) Failure of a single wired trunked console dispatch position.

    d) Failure of a site frequency standard provided that redundant equipment automatically switches into operation in accordance with the RFP.

    e) Momentary (ten seconds) system outages during switching to redundant control equipment.

    f) Minor errors in the subscriber equipment database affecting fewer than 50 non-fixed radios.

4. During the performance period, the PROPOSER shall provide replacement parts and materials and qualified personnel to service the fixed equipment at the sites of work, within 2 hours after notification of a major equipment failure as reported to PROPOSER's service facility. The PROPOSER shall have sufficient personnel and parts available to maintain the equipment so that the equipment can be repaired within eight hours after notification of equipment failure. This provision shall apply on a working hour basis of 24 hours per day, seven days per week (including holidays).

5. During the performance period, the PROPOSER shall establish and maintain the following documentation:
    a) Prepare and maintain a service/repair record system.
    b) Prepare and maintain a failure reporting system to insure that all failures are reported properly to the Township. A failure log shall be available for inspection by the Township at all times. In addition, a formal failure report shall be submitted to the Township on a monthly basis and shall show for each failure:
        i) The original complaint
        ii) The problem actually found
        iii) Repairs performed
        iv) Itemized list of parts replaced
        v) Technician's name
        vi) Any FCC required measurements made due to repairs.
    c) The documentation shall be maintained on a common electronic database in ASCII format, the database shall permit sorting by field to facilitate the analysis of maintenance records.
    d) If the contract is negated because of failure of the equipment to operate successfully during the performance period, the PROPOSER shall provide the Township with the necessary packaging and shipping instructions and the Township shall then cause the equipment to be shipped to the PROPOSER at no cost to the Township.

D. As-Built Documentation

1. PROPOSER shall provide system design services (development of specific details consistent with the contract documents) as required to complete shop drawings for the installation including detailed documentation for OLD BRIDGE TOWNSHIP review and detailed documentation of as-built conditions.
2. PROPOSER shall provide complete as-built documentation within 60 days of final system acceptance detailing all aspects of the installation including:
    a) Equipment provided
    b) Plan and elevation drawings of all equipment including antennas on tower
    c) Cabling and terminations
    d) Installed location
    e) Block and system level diagrams
    f) Termination panels
    g) Programming
    h) Set-up and alignment information

8. TRAINING REQUIREMENTS

8.1 Training Program

A. The PROPOSER shall develop and conduct professionally prepared training programs to allow Agency operating personnel to become knowledgeable with the system and the operation of their individual equipment.

B. The successful Proposal shall schedule training in cooperation with OLD BRIDGE TOWNSHIP, with at least seven days' advance notice.

C. PROPOSER shall describe in detail end-user, system administrator, and maintenance training programs.

1. Model specific end-user equipment training shall be proposed.
2. Hands-on System Administrator training shall be proposed.
3. Hands-on technical maintenance training shall be proposed.
4. Test equipment shall be provided for training as needed.

D. End User Equipment Training

1. A large number of users from a wide variety of agencies will need to be trained; this training should be designed as a "train the trainer" course.
2. PROPOSER shall be prepared to train, and provide retraining materials to ten (10) trainers.
3. The training should be oriented to optimum use of the equipment, proper nontechnical care and operation, and characteristics of faulty operation.
4. Training shall include the function and operation of all controls.
5. The instructor shall give operational demonstrations of all PROPOSER supplied equipment and should permit "hands-on" operation of equipment by trainees.

E. System Administrator Training

1. The System Administrator Training shall be oriented to optimum use of the equipment, proper non-technical operation and care, and the characteristics of faulty operation.
2. Training shall be oriented to permit OLD BRIDGE TOWNSHIP personnel to effectively manage and administer the operation of the radio network.
3. Training should provide basic knowledge of the overall System Management functions, their purposes, and an introduction to basic navigation and use of the Radio System Management applications.
4. Training shall provide information regarding the use of system reports and real-time data to monitor performance and make adjustments necessary to maintain acceptable system performance levels.

F. Maintenance Training

1. Training shall be oriented to technical maintenance, care, and the characteristics of faulty operation.
2. Maintenance Training shall include troubleshooting, repair and alignment in accordance with equipment manufacturer's recommendations.
3. The instructor shall give maintenance demonstrations of all PROPOSER supplied equipment and shall permit "hands-on" maintenance of equipment by trainees.

4. The PROPOSER will be required to provide maintenance training for at least three (3) of OLD BRIDGE TOWNSHIP 's Project Personnel who in turn will train the remainder of those people needing training.

G. Training Materials

1. Training materials shall be provided for all students covering all aspects of the training. Students will retain all such training materials.
2. Training materials shall be professionally produced, and provided in heavy duty three ring "D ring" style locking binders. Loose leaf materials are not permitted. Paper shall be 8 1/2 x 11" whenever possible. If larger paper is utilized it must be professionally incorporated into the document.
3. Illustrations and photographs, where provided, shall be specific to the OLD BRIDGE TOWNSHIP installation. Color photos must be provided where detail or clarity is supported by use of color. Black and white photocopying of color materials is unacceptable.
4. PROPOSER shall provide fully editable (softcopy) versions of all training materials so that the OLD BRIDGE TOWNSHIP trainers can update the course materials over time. All such materials shall be provided in Microsoft Office 2010 format or another format approved by the OLD BRIDGE TOWNSHIP. Where possible, document files shall be provided in a section/chapter by section/chapter break-out AND a fully compiled version. Tables of contents, formatting, and page numbering shall be dynamic and self-modifying when the document is edited.

9. WARRANTY, MAINTENANCE AND SUPPORT REQUIREMENTS

9.1 Warranty

A. Warranty: One Year After Final System Acceptance

1. The system described herein shall be the total responsibility of the PROPOSER prior to system acceptance, and for one year following final system acceptance, under the warranty period at no additional cost to OLD BRIDGE TOWNSHIP.
2. System performance, and all hardware, parts, and materials shall be warranted, including all related equipment labor, installation, handling, inspection, return and delivery charges, and fees.
3. All software and firmware associated with system features, functions, and capacity as required by this specification shall be warranted. All updates to software during the term of maintenance or service shall be included at no additional cost.
4. All components within this system shall be free of any date sensitive issues. This is to include any date or time stamp that may affect the performance of the system, or any part thereof.
5. If the manufacturer, distributing PROPOSER or OLD BRIDGE TOWNSHIP identifies any date-related problems, the equipment shall be repaired and/or replaced at the PROPOSER's expense.
6. PROPOSER shall fully describe all other terms and conditions of the warranty in the Proposal.

B. Latent Defects

1. The PROPOSER, at no cost to the OLD BRIDGE TOWNSHIP, shall correct latent design defects or recurring problems relating to software, hardware or overall system design, for a period of three (3) years after final system acceptance. A "latent" defect is defined as a hardware defect:(1) which renders the system equipment inoperable and causes a "stop ship" condition to production systems;(2) which reasonable inspection would not reveal; (3) a defect which could not have been reasonably discovered by OLD BRIDGE TOWNSHIP 's inspectors; and (4) a defect that could not be located by any known or customary test under the conditions in effect at the time.
2. If a latent defect in the system equipment is discovered after OLD BRIDGE TOWNSHIP has accepted the system equipment, during the warranty period from the manufacturer for (3) years, it shall be the PROPOSER's responsibility to replace the equipment that has the latent defect at its expense. System malfunctions due to software shall be corrected at no cost to the OLD BRIDGE TOWNSHIP.

9.2 Maintenance

A. Maintenance Service – Maintenance after First Year

1. PROPOSER shall propose extended warranty services on an annual basis for years two through five for radio system, subscriber units, microwave, consoles and logging recorder.
2. The extended warranty specified shall not deprive OLD BRIDGE TOWNSHIP of other rights OLD BRIDGE TOWNSHIP may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by PROPOSER under requirements of the Contract Documents.
3. PROPOSER shall provide repair/return services for a period of ten years from date of system acceptance.
4. Radio unit programming software shall be supported on current and future standard PC platforms for a minimum of ten years from date of system acceptance.

5. Notification shall be given at least one year in advance of any change of status from products available from regular production to maintenance only.
6. PROPOSER shall fully describe all other terms and conditions of the extended warranty in the proposal.
7. 24x7 Remote System Monitoring
8. PROPOSER will provide Phase 2 P25 system upgrade costs to be installed within the first five years

B. General Requirements
1. The approach to maintenance of this system shall be preventive maintenance. All system upgrades and patches including hardware, firmware and software shall be included in the Maintenance Service.
2. Maintenance provisions shall be specified in the proposal for the first-year warranty period after system acceptance.
3. The PROPOSER shall include in the proposal the terms and conditions of the warranty covering the equipment. The PROPOSER shall state in the proposal the name, address, and capabilities of the service shop(s) providing warranty service.
4. Comprehensive maintenance services shall be proposed for the network.
5. Maintenance for all items in the system shall be on a standard maintenance basis for two-hour response time, seven days a week, unless otherwise specified.
6. The PROPOSER shall offer a 24-hour service response system where users can dial one toll free number to report problems. PROPOSER staff will then dispatch the proper technician in the allotted response time to resolve problem. PROPOSER staff must generate a trouble report detailing who called, what the problem was, how it was resolved, response turn time, and how much it costs to repair (if applicable).

C. Response Times

1. During the system acceptance period, standard one-year warranty period following system acceptance, extended warranty period, and under the provisions of any proposed maintenance plan, the PROPOSER shall have a qualified technician available to respond to system failures within two hours at all times.

D. Restoration of Service

1. During the system acceptance period, standard one-year warranty period following system acceptance, extended warranty period, and under the provisions of any proposed maintenance plan, restoration of service will be expected to be accomplished within two hours after arrival of the technician except where failures are caused by outside effects such as Acts of God.
2. It is recognized that certain failures may occur as a result of extraordinary multiple and/or sequential failures of individual parts, systems, or components, or as a result of secondary events (e.g., fire) which are beyond the reasonable control of the PROPOSER. In such instances, where specially fabricated parts or components will be required to repair the system, or where necessary repairs clearly exceed those which are reasonably considered as "field repairs", PROPOSER will not be required to make necessary repairs within the two hour time frame noted above. PROPOSER will be required to meet with OLD BRIDGE TOWNSHIP's representative within that time frame, however, to reach a mutually agreeable timetable for both interim repairs and total system restoration.
3. For each occurrence that the PROPOSER cannot meet the above criteria for any reason during a warranty period, the PROPOSER will provide one additional month of warranty service beyond that originally contracted.

E. Escalation Procedures

1. PROPOSER shall describe escalation procedures to be used if the trouble is not resolved within required times.

F. Maintenance Standards

1. Replacement parts shall be equal in quality and ratings as the original parts.
2. Equipment shall be maintained in a clean condition. Oil, dust, and other foreign substances shall be removed on a routine basis.
3. Equipment and system performance shall be maintained at the level initially described in these equipment and systems specifications. The service organization shall maintain records to confirm that this has been done.
4. Routine maintenance procedures recommended by the equipment manufacturer shall be followed.
5. Maintenance records shall be available for OLD BRIDGE TOWNSHIP's inspection upon request. Records shall be maintained by the PROPOSER's maintenance shop throughout the warranty period (and any subsequent maintenance contract period), and shall revert to OLD BRIDGE TOWNSHIP upon termination of the warranty (or maintenance contract).
6. PROPOSER shall provide only factory trained and authorized maintenance personnel.
7. The service organization(s) shall maintain comprehensive installation and instruction manuals for all systems equipment. These manuals shall be the property of OLD BRIDGE TOWNSHIP, and shall revert to the OLD BRIDGE TOWNSHIP at such time as OLD BRIDGE TOWNSHIP assumes the maintenance responsibility for the system.
8. During any warranty period and any period covered by a maintenance plan, PROPOSER shall provide documentation of all system maintenance performed to OLD BRIDGE TOWNSHIP by the fifth day of each month detailing the previous month's work. This report will include all repairs or exchanges on all fixed equipment. The report shall also include a list of all units repaired and the cost and all units exchanged. The report will also include a list of any repairs pending and their current status.
9. If a fixed equipment module or equipment fails more than twice during the acceptance test or twice during the one year warranty period, the PROPOSER shall meet with OLD BRIDGE TOWNSHIP to discuss and explain such failures. If, in the opinion of OLD BRIDGE TOWNSHIP, these failures indicate that the equipment is potentially prone to continuing failures, the PROPOSER shall replace it at no cost to OLD BRIDGE TOWNSHIP.

G. Hardware Maintenance Contract

1. PROPOSER shall provide one-year hardware maintenance contracts for years two through five after system acceptance. It is the intent of this paragraph to obtain maintenance quotations on those items which are not directly related to the normal radio shop maintenance articles.

H. Software Maintenance Contract

1. PROPOSER shall include a software maintenance contract to take effect immediately following the expiration of the warranty period, and to be renewable on a yearly basis with the maintenance agreement.
2. During the software maintenance contract period, the PROPOSER shall provide at no additional cost, periodic upgrades of any and all system operational software. The frequency and timing of these upgrades during this period will be at the sole discretion of OLD BRIDGE TOWNSHIP. This covers only upgrades by the PROPOSER or Original Equipment Manufacturer or Original Software PROPOSER that are:
    a) Patches for defective software
    b) New releases that are corrective revisions for earlier versions and/or
    c) Enhancements to earlier releases
3. New software releases that contain enhancements (i.e., new features and capabilities) will be purchased at agreed upon prices.
4. The PROPOSER shall make every effort to separate corrective revisions from enhancements. If unable to do so, and new releases are necessary to correct problem(s), then the entire release (including enhancements) shall be provided to OLD BRIDGE TOWNSHIP at no additional expense.
5. All back-up media and revised software manuals shall also be provided to OLD BRIDGE TOWNSHIP at no extra cost at the time of any software revisions.
6. Software upgrades shall be performed by the PROPOSER at times agreed upon by OLD BRIDGE TOWNSHIP.
7. All software releases for all program-controlled devices shall be brought to the same release level prior to the conclusion of the maintenance period.
8. All system definition parameters and other unique information (data sets) used to operate the mobile radio system or any associated sub-system included shall be backed-up onto removable media on a quarterly basis during the maintenance period by the PROPOSER at no cost to OLD BRIDGE TOWNSHIP. These media shall be turned over to OLD BRIDGE TOWNSHIP for safe, off-site storage.
9. Any notices alerting to software problems either generated and circulated internally by the PROPOSER or received by the PROPOSER from the original Software Provider, shall be given to OLD BRIDGE TOWNSHIP within 30 days of receipt.
10. All conditions above also apply to all firmware installed in any products included as part of this system.

I. Service Shops

1. PROPOSER must state the capabilities of the service shops or organization(s) that they propose to provide installation and warranty service to support the proposed system. PROPOSER shall list the location of their maintenance shop recommendations within their proposal.
2. Provide a list of all maintenance shops within the Project Area or adjacent counties including the following information:
    a) Shop name
    b) Address
    c) Phone number

d) Manager's name
e) Whether it is the PROPOSER, manufacturer, or privately owned shop

3. If the service organization(s) is not wholly owned by the PROPOSER, a copy of the agreement between the PROPOSER and the service organization(s) must be submitted with the proposal.

J. Spare Parts

1. Appropriate and sufficient spare parts shall be provided to OLD BRIDGE TOWNSHIP by the PROPOSER as part of the system procurement and during any warranty period or period covered by a maintenance plan. OLD BRIDGE TOWNSHIP requirements include the following:

    a) OLD BRIDGE TOWNSHIP requires PROPOSER to provide sufficient spare equipment, parts, and replaceable modules to re-provision the most densely configured transmission site and adequately support the system. PROPOSER shall provide a list of the spare equipment that is provided.

    b) OLD BRIDGE TOWNSHIP requires PROPOSER to provide 5% spare equipment for all central site equipment. PROPOSER shall provide a list of spare equipment that is to be provided as part of their RFP.

    c) OLD BRIDGE TOWNSHIP requires PROPOSER to provide spare components for each unique frequency specific device such as crystal assemblies or oscillators if provided. PROPOSER shall provide a list of spare equipment that is to be provided as part of their RFP.

    d) Any frequency specific units shall be listed separately, and line item prices shall be given for each unit.

2. The PROPOSER shall furnish manufacturer’s recommended extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

3. The PROPOSER shall submit data for all proposed spare parts and equipment, which lists each recommended component and a description of its function.

4. The PROPOSER may draw upon this spares inventory as necessary during the warranty/maintenance period, replacing those used on an as-used and timely basis. The spares complement shall include sufficient non-fixed units to enable maintenance on a unit replacement basis.

5. At the end of the warranty/maintenance period, the full complement of spares shall be delivered to OLD BRIDGE TOWNSHIP.

6. Spare parts shall be available for shipment on an expedited basis 24 hours a day, 365 days a year including weekends and holidays. The manufacturer shall provide a 24-hour hotline telephone number for the handling of such orders.

7. Spare parts, including system assemblies, shall be available and supported by the manufacturer for no less than ten years after Final Acceptance of this project.

8. Notification shall be given at least one year in advance of any change of status for products available from regular production to maintenance only (MO).

9. Each PROPOSER shall include the details of a factory depot with a 24-hour delivery guarantee that can be used for obtaining spare parts if OLD BRIDGE TOWNSHIP desires to be self-maintained.